BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

Vol. 30.] 1933. [No. 8.

DIAGNOSIS OF HELMINTHIC INFECTIONS: A TWELVE YEAR SURVEY.

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Within the past twelve years about 300 papers on the diagnosis of helminthic infections have been abstracted in this *Bulletin*. What follows is an attempt to suggest the position to which this great amount of work has brought us. The writer's own division of the subject (1928, **25,** 937)* is adopted, namely into direct, sub-direct and indirect diagnosis. Direct diagnosis is that in which the parasite itself is observed as it lies in or leaves the host, subdirect that in which an

*References are to summaries in this *Bulletin*, the first figure giving the year, the second, in black-face type, the volume number, and the third the page of the *Bulletin* containing the summary in question. Where the year of publication of the original paper differs from the year of publication of the *Bulletin* summary, two dates are given—the first in brackets referring to the original paper, and the second to the *Bulletin* summary.

immature stage which leaves the host is allowed to grow into a less immature one, indirect that in which host reactions to the parasites are observed or provoked, and recorded.

I. Direct Diagnosis.

Certainty in direct diagnosis depends on the obtaining of parasite-containing material and the examination of a sufficient quantity of it in an uncamouflaged state to insure detection of the parasites.

i. Faecal Examination.

1. *Spurious parasitism.*

The usual assumption that parasites found in the faeces have lived in or been born in the alimentary canal of the individual in question is not necessarily correct. They may have been swallowed in mucus from the air passages, as is well realized, or they may have formed part of his food. Kofoid and White (1919, **17,** 87) had reported the finding, in 429 of about 140,000 American soldiers examined in Texas, Oklahoma, New Mexico and Arizona, of eggs which they named *Oxyuris incognita.* Burnell ((1921) 1922, **19,** 668) reported these eggs from Australia and Papua, and Bacigalupo (1931, **28,** 210) from Buenos Aires. Sandground, however ((1923) 1924, **21,** 574), showed that in fact they were those of *Heterodera radicicola*, a free-living nematode which is a common root parasite of radishes, celery, turnips and potatoes, and confirmed the point by finding them in human faeces after ingestion of parasitized roots. Faust ((1924) 1925, **22,** 273) reminded readers how common such addenda may be ; but it is in the case of trematode eggs that this fallacy has been most widely reported. Examples are those of *Fasciola hepatica* and *Dicrocoelium dendriticum* (Strom (1927), 1928, **25,** 456 ; Koulaguine, 1929, **26,** 973), and of fish trematodes (Maeda (1928), 1930, **27,** 453 ; Tubangui & Francisco ((1930) 1931, **28,** 199). Perhaps the finding of *Hepaticola hepatica* eggs in faeces (Skrjabin *et al.* (1929) 1931, **28,** 208) comes in this category, as does certainly the case of a boy reported by Blackie from South Africa (1932, **29,** 401) who had fed on field rats. Blackie also reports that his examinations covered the case of a man who showed in the faeces the eggs of *Schistosoma mattheei* after, and only after, he had enjoyed a satisfying length of half-raw ox gut.

2. *True parasitism.*

As regards true intestinal parasites, the main work has been done on hookworms, and what follows applies to them unless otherwise indicated.

The microscope, used for the detection of hookworm eggs, and the examination of the stools after a vermifuge, have been set in antagonism. Darling, Barber & Hacker ((1920) 1921, **18,** 117) found a difference in favour of worm recovery, by straining after treatment, of 4·6 per cent., and state that where an infection percentage of 80 was obtained by examination for ova there was little doubt that one of 90 or more would have been obtained by treatment. Hackett ((1920) 1922, **19,** 242) put the margin in favour of worm counts as being 15 per cent. ; Payne, Cort & Riley ((1923) 1924, **21,** 220) concurred in the superiority of worm counts but pointed out their expense and tediousness ; Darling & Smillie ((1921) 1922, **19,** 247) reported 50 persons

negative to microscopic examination of the stools "as carried out in the routine post laboratory," 23 of whom passed worms after a vermifuge, and pointed out that in those harbouring 5 to 20 worms it was chance which determined the finding of eggs. In connexion with this SMILLIE, however ((1922) 1923, **20,** 951), held the microscope reprieved since it displayed 94 per cent. of all persons harbouring more than 10 worms. Indeed it was more than reprieved by him, it was commended; for "the microscope may or may not give a positive diagnosis for a case harbouring 10 hookworms or fewer, but even if it fails it is doing a favour to the individual, for 3 or 4 or even 10 hookworms do not cause anyone sufficient injury to warrant the inconvenience and discomfort of two full treatments for hookworm disease." Whether light infections do in fact harm the host, or whether the medical man must in the interest of his patient attempt a diagnosis of the worm-load his patient carries, is considered below, but clearly the conclusions of DARLING & SMILLIE just quoted can be of general application, only if all microscopic techniques are of equal value, or if the one they used, which is nowhere stated, was the best of its kind.

All diagnostic techniques are emphatically not of the same value. Of them the simplest is the faecal smear, but nearly 30 years ago it was realized that examination of such a preparation might have to extend over many square inches before the first hookworm egg was found. A timely reminder of this lies in the report of KOBAYASHI *et al.* ((1929) 1930, **27,** 439); they examined 185 men by faecal smear on 6 occasions; for hookworms the first smear disclosed 83 infections, all six 129. Again, SCHWETZ & BAUMANN ((1929) 1931, **28,** 173) and ROSS ((1929) 1930, **27,** 438) note that the infection figures obtained by examination of a smear are pure chance. HAUSHEER and HERRICK ((1926) 1927, **24,** 195) reported, however, that examination of one square inch of faecal suspension, dilute enough to allow ordinary print to be read through it, will reveal hookworm ova if these, as measured by Stoll's dilution egg-counting method, number 600 or more to the gram (which implies on Stoll's computation 30 to 60 worms) and hold that the user of this technique may rest assured that persons negative to such smears properly examined were not suffering from hookworm disease.

(*a*) *The means of grading concentrative techniques.*

At all events there have come into use the well-known concentrative techniques aiming at collecting eggs uncamouflaged on a small area, which techniques themselves vary greatly in accuracy. Their worth has been estimated in one of three ways. First, their capacity to display under the microscope a multitude of eggs usually attested by a striking microphotograph, the most recent example being that of DE RIVAS ((1932) 1933, **30,** 206). Almost any concentrative technique will on occasions produce this effect; the method is without control and as a real test is valueless. Secondly, there has been used the comparison of positive results from the same faeces given by different techniques. This is the usual method of comparison. Its value is relative; for it is clear that all sufficiently heavy infections will be detected by the smear itself, but that as infections become progressively lighter techniques, which are being compared by their ability to detect eggs, will one by one cease to display them; they will arrange themselves in their relative values, but their real accuracy will not be shown. Thirdly, the attempt has been made to determine what percentage of eggs actually contained in a faecal specimen is

collected by various concentrative techniques. This is the only really accurate method of appraisement, but before 1921 it had apparently been attempted only by BASS in 1909, HALL in 1911, LANE in 1918 and WRENCH in 1919. Nevertheless it is no easy matter to be sure of the real egg-content of faeces. The seemingly easy way is to count the eggs in a thin film of a measured quantity of faeces, but it is noteworthy that MHASKAR (1923, **20,** 640a) found that by floating such a film after counting it as a film there was an increased count of 14 per cent.

(*b*) *Egg-counting techniques.*

Of the three uses to which egg-counting techniques have been put—the determining of the worm-egg ratio, the measuring of the load of infection of a community, and the determination of the real efficiency of concentrative techniques by comparison of the ovum content of the faeces with the egg collection by any technique—the last clearly requires all the accuracy which can be obtained. Although the ordinary reader may well imagine from the claims made for it nowadays that egg counting and particularly "dilution egg counting" are new, nothing could be further from the truth. LUTZ, LEICHENSTERN and PARONA used them nearly 50 years ago, and it was just because they were a routine in his laboratory in 1897 that LOOSS was led to recognize the increase in his own hookworm infection which led to the discovery of the skin route of infection. Most of the controls devised to determine the egg content of faeces are dilution egg counting techniques. The methods of fifty years ago and Control D* used a watery faecal suspension, Control A suspended in water the centrifugal deposit from a strained faecal suspension, Control B used the faecal deposit without previous straining, Control C suspended in equal parts of water and of a quinquenormal solution of caustic soda, thus making a decinormal solution, Control E suspended the centrifugal deposit in a half-saturated common salt solution which has a specific gravity of 1,100. Stoll's technique (1923, **20,** 950) suspends faeces directly in decinormal caustic soda solution, and he and others commonly give it the distinctive name of "the dilution egg counting technique." The CALDWELLS (1926, **23,** 775) mix the faeces with 30 per cent. antiformin, an hour later add sugar solution with a specific gravity of 1,230, and mix by blowing air bubbles through it; it is a dilution-floatation technique. The Hamburg technique (HUNG (1926) 1927, **24,** 195; FÜLLEBORN, 1927, **24,** 1008) floats faeces in a saturated solution of common salt in a vessel of stated diameter and samples three-sevenths of the surface by floating coverslips on it. D.C.F.F., or direct centrifugal floatation pushed to finality, consist in repeating D.C.F., or direct centrifugal floatation 4 times and counting the eggs under the 4 covers as well as those obtained from the pour-off.

D.C.F.F. proved in LANE's tests (summarized (1928) 1929, **26,** 605) to have a higher average count and a smaller variation therefrom than did any of the other counting techniques, and he was accordingly forced to use it as his standard. He found that of the dilution egg-counting techniques the best was Control E, that which uses a salt solution with a specific gravity of 1,100 which seems to be about that of hookworm eggs. The maximum, average (in heavy type), and minimum collections were: Control A, 49, **37,** 26; Control B, 92, **75,** 39; Control C, 133, **50,** 12; Control D, 95, **50,** 39; Control E, 103, **82,**

* The lettered controls are from LANE (1924, **21,** 574).

61; D.C.F.F., 114, **100,** 94. To his tests (1927, **24,** 542), Stoll's technique proved in his hands very erratic as compared with D.C.F.F. STOLL and HAUSHEER (1926, **23,** 776a) reported poor results with D.C.F.F. and tendered advice as to how it might be improved, and SOPER held that the deposit in salt solution had to be stirred between the centrifugings before reasonably good results could be obtained, and that even so 35·6 per cent. of the eggs were not recovered. LANE (1927, **24,** 542) pointed out that in these tests his technique had been arbitrarily or deliberately altered, and showed that had it been carried out properly these objections would never have been made. The necessity of carrying out techniques exactly as advised before fair comparisons can be made was emphasized in the review of MENSE's book (1929, **26,** 867) where the results of HUNG's curious "Ersatz" for D.C.F.F. ((1926) 1927, **24,** 195) were quoted as if it were the real thing, and Stoll's and Willis's techniques and D.C.F. were incorrectly described. STOLL claimed accuracy for his technique on three grounds: (1) Individual counts from the same suspension vary within 10 per cent. of their average, (2) Counts from the daily faecal deposit from the same person are even, (3) Counts of other helminthic ova are even. Regarding these: (1) LANE ((1932) 1933, **30,** 55) pointed out that this had not been so in 25 per cent. of cases in Stoll's skilful hands (STOLL and HAUSHEER, 1926, **23,** 776a); (2) STOLL ((1924) 1925, **22,** 498) reported eggs per gram as varying from 400 to 1,330, and per day from 27,260 to 141, 680 in formed stools, and maintained after 18 pages of discussion that the formula representing the real relationship between stool and egg count could be obtained by the formula*

$$\Omega = \frac{n.\Sigma xy - \Sigma x.\Sigma y.}{\sqrt{[n.\ \Sigma x^2 - (\Sigma x)^2]\ [n.\Sigma y^2 - (\Sigma y)^2]}}$$

(3) SOPER (1926, **24,** 196) using trichuris to check evenness of suspension in 43 counts from the same suspension found that they varied from 8 to 42 with an average of 23, LANE's figures (1927, **24,** 542) being confirmatory. In the same paper the CALDWELLS' technique is reported as giving results varying as 1 to 4; SINCLAIR (1929, **26,** 553) obtained the same figure when eggs were estimated as below 3,000 per gram; the average, maxima and minima were as 1,367 to 1,190 when they were above that figure.

(*c*) *Concentrative methods.*

The physical methods which have been used to produce virtual or actual concentration of eggs are these.

Clearing.—To render faecal matter transparent, and thus display eggs, glycerine and cedar oil have been advocated (HEIN, 1927, **24,** 978; PEVERELLI, (1928) 1929, **26,** 969; KORTENHAUS, (1928) 1930, **27,** 446), but CURRAN reported that liquid paraffin and olive oil were equally effective (*China Med. Jl.*, 1928, **42,** 210). For colourless eggs the value of the procedure depends on the relative rates of clearing of them and of faecal matter; LANE's counts of hookworm eggs (1924, **21,** 574) showed that clearing immediately increased the egg numbers by 19 per cent. over those shown in the same smear examined uncleared, but thereafter they rapidly cleared and became relatively or actually

*It is stated in explanation merely that Ω is $-0{\cdot}636 \pm 0{\cdot}073$, that x and y signify values not deviations, that the formula is that of JENNINGS, and that the probable error can be determined from PEARSON's Tables.

invisible. For coloured nematode eggs, however, clearing is generally helpful (KORTENHAUS). CURRAN found it useful for non-operculated tapeworm eggs, practically valueless for the large trematode eggs, but of some value for the small ones. Its use is limited.

Straining.—USAMI & KAMADA ((1921) 1923, **20,** 205) found that two-thirds of the eggs contained in a faecal suspension were retained in a gauze fabric through which it was strained ; LANE's (1924, **21,** 574) comparison of Controls A and B showed a loss of 30 to 60 per cent. from straining through fine wire gauze. Straining causes great loss of eggs.

Floatation.—The fact known for nearly 30 years that heavy salt solutions penetrate nematode eggs much more slowly than they do most ordinary faecal matter, has been greatly used latterly to display them by making them float in a fluid whose specific gravity is heavier than themselves. A saturated solution of common salt, that generally used, has a specific gravity of just over 1,200 and not of 1,130 as WILLIS stated ((1921) 1922, **19,** 246)—a reminder that the best way to be sure of saturation and to avoid air bubbles is to boil the solution till a scum of crystals floats on the surface (LANE, 1923, **20,** 947). A three-quarters-saturated solution (s.g. 1,150) floats hookworm eggs as satisfactorily as a saturated one and floats much less other matter (LANE, 1925, **22,** 495), and is that of election for these eggs. GUILLINY ((1931) 1932, **29,** 37) showed that hookworm, ascaris and trichuris eggs did not begin to sink in a saturated solution till they had been in it more than an hour.

Floatation in an inverted funnel.—Whether gravity or centrifugal force were used, the egg collection in 12 experiments (LANE, 1923, **20,** 947) was 12 per cent. of the numbers shown to be present by counting techniques which are now known greatly to underestimate the egg content of faeces.

Surface tension has been used either to sweep faecal matter off a slide and leave on it hookworm eggs by virtue of the stickiness which they possess in water and lose in strong saline, or to pick up a surface film with any eggs which are floating in it.

Movements.—When eggs have been collected in a preparation movements of it may cause them to be herded at a particular spot.

It has become clear that of the physical methods used for concentrating eggs floatation is by far the most effective, but that for the success of any concentrative technique three principles must be strictly observed. (1) The stool must be completely disintegrated, eggs must be quite free of faecal matter before they can be collected apart from it (LANE, 1923, **20,** 947) ; (2) the amount of stool used must be enough to contain eggs if a single female worm is normally ovipositing and to allow for all loss which the selected technique may entail (LANE (1925) 1926, **23,** 261) ; (3) the technique must not be overtried, its limit of effective concentration must not be exceeded (LANE, 1923, **20,** 974).

(*d*) *Concentrative techniques.**

Gates's technique ((1920) 1921, **17,** 45) must be mentioned for its final herding of eggs by movements of the vessel containing them.

Willis's technique ((1921) 1922, **19,** 246) uses gravity floatation to bring the eggs into contact with a cover glass which overlies the floatation fluid. On lifting the glass, surface tension cuts off and brings away the fluid underlying it together with such eggs as are there. As

*Techniques other than those here mentioned are found in **18,** 131 ; **19,** 658 ; **20,** 617 ; **21,** 194, 530 ; **25,** 447, 936.

originally described it was used in a dilution of one in six, which greatly exceeds its limit of effective concentration. SAWYER & SWEET (1924, **21,** 581) describe it as a simple and efficient test of the presence of hookworm infection. Compared with D.C.F.F. it delivered one-sixth of the eggs (LANE, 1925, **22,** 495). CHANDLER ((1925) 1926, **23,** 775) using a dilution of one in sixteen obtained very irregular results and collected 6·5 per cent. of the eggs which D.C.F.F., with an improvised apparatus, showed to be present. EARLE (1924, **21,** 764) found that 40 per cent. of cases diagnosed as negative by this technique passed hookworms when treated.

Khalil's technique ((1924) 1925, **22,** 455) strains the faecal suspension through fine wire gauze, floats the precipitate in the inverted cone of an Erlenmeyer flask, and loops off the surface as in the Kofoid and Barber technique. Loss of eggs by straining and by floating in an inverted cone explain the fact that to LANE's tests ((1925) 1926, **23,** 261) it displayed 2 per cent. of the eggs which D.C.F.F. showed to be present. Its use in Egypt and an emphatic claim for its excellence nevertheless persist (KHALIL, 1931, **28,** 665).

D.C.F. (LANE, 1924, **21,** 574) produces thorough disintegration in water by vigorous shaking with a hollow cylinder, centrifuges, and floats the precipitate in a salt solution of s.g. 1,150 for hookworm eggs or one of 1,200 for those of ascaris or trichuris. Both solutions float hookworm eggs equally well, but the lighter floats much less unwanted matter than the heavier. Though ascaris and trichuris eggs need a s.g. of 1,300 to float them as well as one of 1,150 floats hookworm eggs, that of 1,200 floats in one spin about 44 per cent. of ascaris and 25 per cent. of trichuris eggs (LANE (1925) 1926, **23,** 261). Eggs of the hookworm type (trichostrongylus and ternidens) seem to float as readily as do hookworm eggs; trematode and unfertile ascaris eggs float badly or not at all; no counts have been made for cestode infections. LANE ((1932) 1933, **30,** 55) claims that egg counts show that it is the only technique which should be employed where accuracy is desired. Its collection compared with WILLIS's has been noted.

The second method of grading concentrative techniques—the extent to which they have in practice given positive results—although not scientifically critical, has significant value. HÄRLE, SÜTTERLIN & ZEISS ((1923) 1924, **21,** 192) in 878 children's faeces found that the Hamburg direct gravity floatation method gave 15 to 25 per cent. more positives than did a simple smear; they dealt mainly with ascaris. HAUSHEER & HERRICK ((1926) 1927, **24,** 195) found that 18 of 70 covered smears one inch square were negative, but that all cases were positive to D.C.F. In Russia the methods of FÜLLEBORN, TELEMANN and the smear gave positive percentages of 75, 52 and 8 (1931, **28,** 175), infections being mainly by trichuris. MAPLESTONE and MUKERJI ((1929) 1930, **27,** 419) reported a group of 12 cases of which Stoll's technique disclosed hookworm infection in 4 and D.C.F. in 11. NIESCHULZ & HOFKAMP ((1930) 1931, **28,** 222) emphasize the value of D.C.F. in the search of worm eggs and coccidial cysts in dog's faeces, and point out that a negative diagnosis can be made in two minutes. GUILLINY ((1931) 1932, **29,** 37) found that as compared with Willis's technique the percentage of hookworm infections discovered by a smear was 73, of ascaris 93 and of trichuris 55. STOLL and HAUSHEER (1926, **23,** 776a) stated their belief that D.C.F. was the most accurate diagnostic technique available for hookworm eggs, and STOLL (1930, **27,** 971b) relied on it for detection of eggs of *Haemonchus contortus* when

the number of eggs was less than 1,000 per gram. MAPLESTONE ((1932) 1933, **30,** 203) found that D.C.F. added 25 per cent. to the positives displayed by Stoll's dilution technique. This method of appraisement also puts D.C.F. at the head of the list.

(*e*) *Quantitative diagnosis.*

At the bottom of the egg counting which at present forms so great an element in estimating the load of intestinal nematodes in area or individual, is the assumption that the rate of oviposition is so regular and constant that by it the worm load can satisfactorily be determined.

Regarding counts on the same untreated persons BROWN ((1927) 1928, **25,** 464) followed four cases of infection with hookworm, ascaris and trichuris by Stoll's egg counting method for periods of 10 to 23 days, and concluded that egg production was a very constant phenomenon. The ordinary medical man attempting to estimate with exactness the worm load of an individual patient should accept this statement with caution. For example in Brown's case, followed for 23 days, the numbers, to the nearest thousand, varied for hookworms from 13 to 24 per gram and 129 to 3,459 per day, the numbers for ascaris being 8 to 20 and 111 to 2,116, while for trichuris, comparing two formed daily stools of 103 and 108 gm., the eggs were 439 and 112 per gram. Even six-day averages were too variable to give a sharp indication of worm load.

It will be recalled that, using dilution egg counts about 50 years ago, PARONA put the faecal egg content produced by each female hookworm as 42 per gram with a total output of 6,666 daily, while LEICHTENSTERN, checking dilution egg counts by autopsy put the eggs per gram as 47. Nearly 40 years later STOLL (1923, **20,** 951) put the figure as 44 for formed stools basing his conclusion on 4 cases, as 22 for mushy stools basing this on 2 cases, and as 11 for liquid stools, basing this on one case.

But he omitted to report any re-examination for eggs in 4 of his seven cases. In most of them there is then nothing to suggest that the numbers of eggs counted really corresponded to the number of worms recovered. Yet this figure and method of computation have been widely accepted and used. Nevertheless there is much evidence against it. DARLING ((1922) 1923, **20,** 254) puts the eggs per gram per female as 22 ; DAVIS ((1924) 1925, **22,** 499) as 177 for formed stools and 111 for unformed ones, but here, too, there does not seem to have been re-examination ; LANE's figures (1925, **22,** 495) for post mortem examinations varied from about 10 to 500 ; HILL ((1926) 1927, **24,** 196) using Stoll's count in 93 cases most carefully worked over had an average of 18·3 ; STOLL ((1929) 1930, **27,** 971) found that in two sheep infected with *H. contortus*, one had a worm-egg ratio 34 times greater than the other ; MANALANG (1927, **24,** 1006) had an average of 44 in 18 cases with extremes of 26 and 100 ; SCHAPIRO & NAUCK ((1931) 1932, **29,** 419) using the contents of the bowel at autopsy found the average twice as great as should be expected from Stoll's factors, while individuals showed large discrepancies. The allowance for consistency as between formed and mushy stools were put by DOCHERTY (1926, **23,** 767) as 52 to 40 ; LANE ((1930) 1931, **28,** 227) showed that the moisture content of stools of different consistencies did not fall in with Stoll's formula ; HERRICK (1928, **25,** 967) that when he made this allowance for dogs' faeces his results were less even. This allowance for consistency cannot then be maintained. An allowance for species of hookworm is necessary. Probably SOPER's conclusion (1927, **24,** 1006) that ancylostomes

lay about twice as many eggs as necators will prove of general application. In this connexion the unwisdom of trying to determine by egg measurement in a heavy salt solution the species of hookworm to which they belong is shown by RODHAIN's observation ((1930) 1931, **28,** 689) that in Ringer's solution the average loss of length in trichostrongylus eggs was 16 per cent. An allowance for age of worms is needful as dilution egg counts by LOOSS (1911) had shown, the faecal ovum content increasing fifteen times in the first 8 weeks following the beginning of oviposition. HERRICK confirmed this for *A. caninum* (1928, **25,** 967) and SARLES for *A. braziliense* ((1929) 1930, **27,** 422, 423). That an allowance was necessary for intensity of infection was first suggested by HILL ((1926) 1927, **24,** 196) by examination of persons infected mainly with necator ; it was clearly demonstrated for *A. caninum* by SARLES ((1929) 1930, **27,** 423), for in his animals when the worm load was increased twelve-fold worm counts were only doubled. LANE having, equally with the abstractor of HILL's paper in this *Bulletin*, missed this point, analysed HILL's 93 cases independently on reading SARLES results, and found ((1930) 1931, **28,** 227) that when fewer than 300 worms had been recovered the daily egg output of each female worm was about 4,000, with between 300 and 600 worms it was 2,500, and with over 600 it was 1,500. For all these reasons he concluded that to attempt from egg counts to estimate the worm load of a community was a waste of time and money. EARLE & DOERING (1932, **29,** 423) next examined by logarithms the results of over 700 cases reported from various sources and concluded that decrease in egg production as worm density increased was sufficiently marked to make it impossible to obtain one factor for estimating worm loads from egg counts over the whole range of infection weight. CHANDLER's work ((1932) 1933, **30,** 223) strengthens the precariousness of conclusions based on any worm-egg ratio, for he showed that inoculation of rats with larvae of *Longistriata* species reduced the egg output of *Nippostrongylus muris* by 90 per cent. This aspect of the matter does not seem to have been studied in man. By converging lines of evidence the belief that worm loads can really be measured by egg numbers is shown to be illusory. They can merely be estimated ; and as pointed out in a note by the abstractor (1931, **28,** 170) this has actually been done in Ceylon with a minimum of labour when comparing the positives to a Willis technique with the laborious counts of a Stoll, for with one exception the nine districts examined were placed in the same order by the two. To spend time and money in making counts by any method in the hope of determining the real hookworm load of a community is merely unwisdom.

For ascaris, BROWN & CORT ((1927) 1928, **25,** 464) place the number of eggs passed daily by a female worm as about a quarter of a million, or 2,000 per gram ; MORETTI ((1928) 1930, **27,** 974) put the daily output as about 100,000. For their detection, then, no concentrative technique will commonly be held needful ; indeed the preoccupation will be whether some concentrative technique used for other eggs may fail to display these. For trichuris MANALANG (1928, **25,** 963) placed the eggs per gram as 310. BRUMPT, however, in his *Parasitologie* quotes MOOSBRÜGGER as reporting 3,000 eggs per gram posited by 447 female worms, or about 7 per gram per female. For *Fasciolopsis buskii* STOLL, CORT and KWEI (1927, **24,** 981) place the daily egg output as between 14,623 and 48,125.

(*f*) *Some miscellaneous points.*

For *Enterobius vermicularis*, whose ova are not normally posited within the bowel, diagnosis by perianal and rectal scrapings has been reported, mainly from Russia. DUBROWINSKI *et al.* ((1929) 1930, **27,** 442) found 72 to 100 per cent. of 757 cases examined in various institutions to be infected. TONKING ((1929) 1930, **27,** 445) reported higher figures in Kenya from nail scrapings than were disclosed by D.C.F. for taenia and enterobius infections, but for ascaris, trichuris and hookworm the reverse was the case. Unfertile ascaris eggs have been dealt with by GOLDSMIDT (1935, **22,** 487), and OTTO (1932, **29,** 751). *Ternidens deminutus* has been reported in considerable amount from South Africa by SANDGROUND ((1929) 1930, **27,** 468) and BLACKIE (1932, **29,** 401). Methods for collecting and preserving cestodes were described by WARDLE (1932, **29,** 748). PLAUT & VOGEL ((1928) 1930, **27,** 748) have pointed out that it is not possible to determine from sections whether a schistosome egg has a terminal or lateral spine.

ii. URINARY EXAMINATION.

To determine whether schistosome eggs passed after treatment are dead or alive HELMY suggested as a delicate test ((1930) 1931, **28,** 669) the cessation of ciliary movement of flame cells. For concentration of schistosome eggs in the urine TOMB and HELMY ((1931) 1932, **29,** 410) found an 80 per cent. increase in positives over smear examination by straining and sedimenting a faecal suspension. BARLOW ((1931) 1932, **29,** 36) has described a method for enumerating and preserving schistosome eggs for examination.

iii. BLOOD EXAMINATION.

BRUG ((1927) 1928, **25,** 471 and 1931, **28,** 171) discovered in the Dutch East Indies a microfilaria in human blood which he designated *Microfilaria malayi*, and described in detail the characters which distinguish it from *Mf. bancrofti*. KORKE ((1929), 1930, **27,** 987) appears to have found the same microfilaria in Orissa, India. RAO (1931, **28,** 683) found an unsheated microfilaria in an Indian prisoner and named it *Mf. actoni*. FÜLLEBORN (1929, **25,** 513) has pointed out how active contraction during life, and the action of various methods of killing and preserving them, alter the length of these embryos. DUNN ((1931) 1932, **29,** 770) has described a method for enticing adult filariae to leave a tissue after death, so that they can thus be collected.

iv. X RAY EXAMINATION.

This is conveniently considered here. In the intestinal canal ascaris has been disclosed by failing to throw shadows while lying within a barium meal (1931, **28,** 688; 1932, **29,** 417). In detecting calcified *W. bancrofti* the value of rays was shown by CHRISTOPHERSON (1929, **26,** 984). O'CONNOR, GOLDEN & AUCHINCLOSS (1930, **27,** 986) demonstrated from X rays combined with sectioning of tissues how extensive the distribution of these worms might be, living and calcified ones commonly lying near one another. BROUGHTON-ALCOCK and WEINBREN ((1930) 1931, **28,** 676), with the good offices of Professor LEIPER and Sir Arthur KEITH, showed that calcified cysts of *Cysticercus cellulosae* threw shadows about 6 mm. long, and those of *Trichinella spiralis* about 0·4 mm. long. The calcified guinea worm has been

defined by its shadow, while an uncalcified one has, at least in part, had its extent displayed by injection into it of lipiodol (ROUSSEL, 1928, **25,** 972).

II. Subdirect diagnosis.

The detection and identification of helminths which have undergone some development since they left man has been concerned mainly with hookworms and schistosomes.

Hookworms.—For the convenient extraction of infective hookworm larvae from soil or cultures BAERMANN's method of soakage in a water-containing funnel is in general use ((1917) 1922, **19,** 252). It is a convenient modification of Looss's technique. Its most easily reached description for English readers is that by CORT *et al.* ((1921) 1923, **20,** 242, a), in which F. K. PAYNE showed the importance of heat in adding to the number of larvae collected. HIRST (1924, **21,** 968) established how greatly its efficiency varied with the type of soil concerned. With a view to compactness, so that many cultures and extractions might be dealt with in an incubator, LANE devised a method (1928, **25,** 467) by which his small cultures were soaked in a petri dish and the extract examined in a glass box. His controlled tests showed (1932, **29,** 423) that it was somewhat more efficient than was BAERMANN's, but that all larvae were not necessarily recovered from the latter unless the funnel were emptied. After 24 hours' soakage neither method necessarily displayed the full infectivity of the sample, indeed larvae might continue to appear for 7 to 8 weeks. FÜLLEBORN ((1921) 1923, **20,** 252) set the culture investigated on a layer of agar extending at least 3 cm. from its edge and noted the tracks of migrating larvae (hookworm or strongyloides) ; a piece may be cut out of the agar and filled with water with a view to collecting larvae.

Regarding culture for the detection of hookworm larvae LANE (1928, **25,** 467 ; 1932, **29,** 423) showed that when culture was depended on for the diagnosis of this infection, the cultures must be trapped by a water moat ; for extraction may disclose no larvae, which yet may be present in the moat, having migrated from the culture and been trapped as they left. The radical alteration which this observation makes in hookworm investigation and prevention does not fall within the present subject.

There has been discussion whether there are differences between larvae of ancylostomes and necators. HEYDON (1927, **24,** 1007) has summarized the differences which he finds.

Schistosomes.—FÜLLEBORN ((1921) 1923, **20,** 219) has described how moisture, heat and light may be used to liberate miracidia, which are then readily seen with a lens swimming in the containing vessel. Controversy has continued regarding the anatomy of the cercaria of *S. haematobium*. BETTENCOURT and DA SILVA ((1928) 1930, **27,** 457) pointed out that the reported differences in the number of glands cannot be put down to errors of observation, they must be due to errors of identification. Those cercariae which they have reported from Portugal came from a single pond from which animals were excluded but which washerwomen invaded. These were infected to the extent of 70 per cent. by *S. haematobium*. They had the unpleasant habit of passing urine in the water as they stood in it washing clothes, all the hundreds of cercariae observed were of the same type with 3 pairs of glands, and they produced *S. haematobium* in mice.

ARCHIBALD and MARSHALL (1932, **29,** 741) infected laboratory-bred snails from cases of urinary bilharziasis, infected *C. sebaeus* with the cercariae and recovered *S. haematobium* from them ; the cercariae had three pairs of penetration glands. The same writers ((1932) 1933, **30,** 210) using the same stringent technique concluded that the cercaria of *S. mansoni* has 5 pairs of penetration glands, 3 pairs of flame cells and 2 pairs of ciliated areas in the body, and one pair of flame cells in the tail, thus confirming in essentials KHALIL's observations ((1922) 1923, **20,** 220).

III. Indirect Diagnosis.

To actual clinical symptoms no reference need be made apart from creeping eruption. Of the recognition of disability produced by infection the main interest lies in the attempt to diagnose the load of infection which divides the sick from the carrier host. Antigen-based tests form a large section of increasing importance.

i. CREEPING ERUPTION.

In America interest in this matter was raised by KIRBY-SMITH ((1925) 1926, **23,** 407) who had seen 2,500 cases. WHITE and DOVE (1928, **25,** 701) implicated *A. braziliense* as the local cause, and were confirmed by SHELMIRE ((1928) 1929, **26,** 555). In Australia HEYDON (1929, **26,** 989) showed that both *A. caninum* and *A. braziliense* could cause it. In the mean time FÜLLEBORN ((1927) 1930, **27,** 425), whose interest in the subject dates as far back as 1908, showed partly on his own person that it could be produced by *Uncinaria stenocephala*. In these cases excision of skin displays an epidermal tunnel in which the larva lies. It is usually situated just under the stratum corneum, though SMITH and ELMES ((1928) 1929, **26,** 688) in Nigeria found one lying immediately over the dermis. Creeping eruption is of course not always due to nematodes.

ii. DIAGNOSIS OF THE INJURIOUS WORM LOAD.

For hookworms this has been undertaken with confidence by means of egg counts, it being assumed : first, that the oviposition rate is a measure of the worm load; second, that the technique used has sufficed to measure infection; and third, that the tests used to measure disability have been appropriate and adequate. Regarding the first point, the evidence collected above has shown that the worm-egg ratio is disturbed by so many factors that it must rest with those who use it to show that in any particular case it is reliable. Regarding the second, Stoll's technique, combined or not with Willis's, has been used. As has been noted, the former has proved unsatisfying in many hands and may fail markedly to detect infection which is present, and the latter may be very inexact. Regarding the third, GORDON ((1925) 1926, **23,** 262) modified Stoll's technique with the hope of making it more exact and relied on tests of haemoglobin, physique, general fitness, mentality and energy to detect disability. He concluded that there was no correlation between worm load and disability unless eggs numbered more than 15,000 per gram of faeces. SMILLIE and AUGUSTINE ((1925) 1926, **23,** 263) using Stoll's and Willis's techniques concluded that all persons with 100 worms or less may be advised that they do not need treatment. In a paper, published within six weeks of the first these writers (1926, **23,** 772b) reduced the critical figure from 100 to

25 ; and SMILLIE and SPENCER (1926, *Jl. Educat. Psychol.*, May, 314) concurred in the last on the basis of mentality tests. STILES (1927, **24,** 536) gave his reasons for concluding that these studies were being pushed to an illogical extreme. WAITE and NELSON had already in 1919 found disability from light infections. LANE (1932, **29,** 173, 1933, **30,** 55) disssented from the conclusions of GORDON and of SMILLIE and his colleagues on the ground that their diagnostic techniques did not necessarily detect and certainly could not measure the lightest infections, and that their disability tests were not necessarily appropriate ; and pointed out that, had the techniques been dependable, the right conclusion to draw from the figures furnished by the latter group would have been the lightest infections are actually a proved handicap. STILES (1927, **24**, 536) recorded ill effects from less than 20 worms and YENIKOMSHIAN and BERBERIAN (1932, **29,** 755) from 8, judged by the effects of anthelmintics. BLACKIE (1932, **29,** 401) showed that in schistosomiasis pathological changes might be extreme and damaging, although parasites were few.

iii. ANTIGEN REACTIONS.

During the last twelve years about 100 papers dealing with antigen tests have been dealt with in this *Bulletin*. Those cited below are such as the reviewer believes to have the greatest importance for practising medical men. The antigen has been obtained from worms of the same or an allied species. If the worm is imbedded in tissue, attempts to obtain the antigen pure, or at least strong, have been made for trichinella by BACHMAN (1928, **25,** 470) by thorough artificial digestion of muscle, for cercariae from snail's liver by TALIAFERRO, HOFFMAN & COOK ((1928) 1929, **26,** 534) by grinding this up and so letting the larvae free themselves from the tissue, and by FAIRLEY and JASUDASAN ((1930) 1931, **28,** 196a) for schistosome cercariae through the use of heavily infected livers of snails. FÜLLEBORN (1926) 1927, **24,** 529) described his technique for obtaining antigen from infective strongyloides larvae. All these antigens are then made from larval forms. TALIAFERRO and HOFFMANN ((1930) 1931, **28,** 214) and FAIRLEY (1931, **28,** 679) have used for filariasis adult *Dirofilaria* as antigen, the former dissolving it in saline, the latter in alcohol. KHALIL & HASSAN (1932, **29,** 741) for schistosomiasis have used adult *S. bovis*. The antigens have a group character and, so far as concerns bilharziasis, FAIRLEY pointed out in 1919 the greater potency of larval than of adult antigen, and (with JASUDASAN) that the alcoholic extracts of normal snail's liver show no antigenic property against bilharzia sera. Hitherto antigen-based tests have proved of little exactness except in infections where parasities live in blood or lymph. Three kinds are worth note.

Precipitin reactions have been obtained by BACHMAN (1928, **25,** 470) for trichinosis but did not appear until some 30 days after infection, by which time, as he points out, a human patient is dead or convalescent.

Intradermal reactions.—FÜLLEBORN ((1926) 1927, **24,** 527) found the immediate reaction specific for *S. stercoralis*, and suggested that the perianal wheals of infected persons are due to penetration there of infective larvae. For schistosomiasis FAIRLEY & WILLIAMS ((1927) 1928, **25,** 458) obtained clear immediate and delayed reactions with snail's liver infected with *S. spindalis*. TALIAFERRO and HOFFMAN obtained a 96 per cent. positive reaction in *W. bancrofti* infection, and FAIRLEY had excellent results with infections by loa, onchocerca, and *W. bancrofti*.

Complement fixation proved valuable in experimental schistosomiasis work by FAIRLEY and JASUDASAN ((1930) 1931, **28,** 198). Fixation occurred in all infected animals and in no others. In filariasis FAIRLEY (1931, **28,** 679) obtained results confirmative of skin tests and pointed out that the two tests appeared complementary—the intradermal detecting intracellular, and complement fixation circulating, antibody. The large amount of work done on them seems to be defining the directions in which these antigen-based tests are likely to be useful, but in the case of intestinal parasites inadequate care has been taken to determine whether in particular cases they are or are not present in the bowel.

BLACKWATER FEVER.

GIGLIOLI (George). **Epidemiological and Etiological Studies on Blackwater Fever in the Interior of British Guiana, 1923 to 1932.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1932. Nov. 30. Vol. 26. No. 3. pp. 204–224. With 2 charts & 3 diagrams. [28 refs.]

This paper deals with observations carried out from 1923 to 1932 on the middle and upper Demerara River in the interior of British Guiana, in an extremely circumscribed and limited area, extending over 45 miles along the banks of the river from Christianburg to Malalli. The population of the district amounts to 7,550 and includes Europeans 65, Portuguese 95, East Indians 1,321, Negroes 3,752, Chinese 98, Aborigines 509, mixed races 1,695, and races not stated 15.

From January, 1923, to December, 1931, there were 12,502 cases of malaria and 63 cases of blackwater; many of the latter were treated repeatedly for relapses. The annual incidence of malaria and blackwater during this period is shown in a chart, as is also the monthly incidence of the two diseases from August, 1926, to June, 1928. The author then passes to a consideration of the relative incidence of blackwater in the various races. Details are given in two tables, from which it appears that the negro shows a high degree of immunity. This is remarkable, because the negro on the Demerara is, in the majority of instances, an immigrant from the coast towns and villages or from the mildly malarial West Indian Islands, where blackwater is practically unknown. Information is also given regarding the incidence of blackwater in the various age groups.

The author next considers the question of blackwater as a family and house disease. The occurrence of blackwater in certain families and houses is a striking characteristic of the epidemiology of the disease on the Demerara River. Of 63 cases 22 (35 per cent.) originated from only 9 families. Details are given. There follows a discussion on immunity in blackwater and the relation of quinine to the disease.

The following care the onclusions :—

"(1) Blackwater fever is the direct result of infection with special haemolytic strains or biological varieties of the *Plasmodium* and more especially of *P. falciparum*; such strains, for the present, cannot be morphologically or otherwise differentiated from the ordinary forms of malaria parasites.

"(2) The epidemiology of blackwater is governed by: (*a*) The geographical and local distribution and incidence of such haemolytic strains; (*b*) The degree of immunity of the population. Immune subjects may tolerate infection without giving clinical evidence of its nature by suffering from haemoglobinuria.

"(3) Immunity to blackwater presents the same characteristics as immunity to malaria; it is a relative or partial immunity, a condition of tolerance or premunition. It may be: (*a*) Racial, most evident in the Negro race; (*b*) Acquired, as shown by the relative immunity of the adult section of a settled, racially non-immune population in the endemic area and by the clinical course of relapsing blackwater fever in children.

"(4) In individuals infected with haemolytic strains the onset of haemoglobinuria may be determined: (*a*) By special virulence of the infecting strain; (*b*) By absence of immunity and impairment of general, non-specific resistance; (*c*) By contingent factors tending to break down the existing racial or acquired immunity; (*d*) By quinine. This drug favours haemolysis experimentally provoked in animals with many known substances. From clinical experience a similar action may be attributed to quinine in the genesis of some cases of blackwater. Quinine and malaria

being everywhere intimately associated, this drug, without being specifically the cause of blackwater, acquires an altogether special importance as it tends to increase the incidence of the disease in those areas where haemolytic strains of the malaria parasites are endemic." *W. Yorke.*

MANSON-BAHR (P.). **Blackwater Fever in England—Clinical Aspects.** —*Trans. Roy. Soc. Trop. Med. & Hyg.* 1932. Nov. 30. Vol. 26. No. 3. pp. 225–230.

The author deals with the clinical records of twenty cases of blackwater observed by him in London during the last 13 years. In quite a large proportion of these cases Manson-Bahr had the opportunity of observing the patient before the onset of blackwater, whilst in 5 cases the cataclysm actually took place whilst the patient was lying in bed undergoing routine treatment for subtertian malaria. In not a single one of these 5 can it be said that the onset had been foreseen. There was no recognizable " pre-blackwater stage."

Of the 20 patients no less than 8 died. In 6 death was definitely due to blood destruction caused by the great haemolysis ; one was due to septicaemia from a parotid abscess after the patient had made a recovery from threatened suppression of urine, and one was due to lobar pneumonia, which also supervened upon suppression of urine. In every case the actual production of haemolysis appeared to be connected with the administration of quinine.

On the important matter of the " pre-blackwater state " the author writes as follows :—

" The recital of details of the onset of blackwater fever in the cases above would seem to indicate that the attack commonly develops without any previous warning ; but I do not think that this is always so, for I still believe that in some cases there may possibly be a recognisable clinical pre-blackwater state—that is to say a cachectic condition due to prolonged infection with the subtertian parasite. I would define the pre-blackwater state as a condition in which the patient has an enlarged and tender liver and spleen and who passes highly coloured urine containing urobilin and usually a cloud of albumin and in whose blood either scanty rings or developing trophozoites may be found and whose red blood corpuscles show much basophilic stippling. Out of this series I saw four cases in this condition a week or more before the onset of blackwater and was able to predict that such an occurrence was liable to take place. Of course one has seen many other cases in this condition in whom blackwater did not eventuate and the difficulty so far has been to be able to decide the dosage of quinine which such a person will tolerate and which will not provoke haemolysis."

[As the reviewer has already stated elsewhere, this line of argument appears to him to be illogical and very unsatisfactory. In the first place Manson-Bahr frankly admits that he was unable to forecast the development of blackwater in any of the 5 cases who were under his care in hospital before the blackwater cataclysm actually took place. The signs which he describes as indicative of the " pre-blackwater state " are typical of chronic malignant tertian malaria and to say that such signs are indicative of the " pre-blackwater state " appears to the reviewer to be the same as saying that any malignant tertian case is in the " pre-blackwater state." This is possibly true, but the difficulty is to say which of them is actually going to develop blackwater when given quinine. There is no doubt that if one predicts that all such cases of malaria are going to develop blackwater one would sometimes be right, but far more often one would be wrong. The

reviewer has already pointed out that for some days before the development of blackwater the urobilin content of the urine may be consistently normal.] *W. Y.*

GUPTA (C. C. Das). **Three Fatal Cases of Blackwater Fever.**—*Indian Med. Gaz.* 1933. Jan. Vol. 68. No. 1. pp. 28–29. With 1 chart.

In this paper clinical details are given of three cases of blackwater fever, one in a Chinaman and two in Hindus. In each case anuria set in early and the patient died of uraemia, notwithstanding intravenous injections of alkali and saline. *W. Y.*

DUFOUR (V.). L'hypocholestérinémie dans la fièvre bilieuse hémoglobinurique.—*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 520–522.

ROBERT (Léopold). Quelques taux du cholestérol sanguin chez des bilieux hémoglobinuriques. [**Blood Cholesterin in Blackwater.**]—*Ibid.* pp. 522–525.

i. The author has estimated the cholesterin titre in the serum of a number of cases of blackwater fever at Antananarivo and at Dakar by means of the colorimetric method of Grigaut. In the severe cases the cholesterin averaged only 0·29 gm. per litre and in moderate cases it averaged 0·77 gm. per litre. Shortly before death in fatal cases there was only a trace of cholesterin in the serum, whilst in the cases which recovered it rose rapidly and sometimes exceeded the normal of 1·5 to 1·7 gm. per litre. In some cases parallel observations were made on the urea titre. As a rule, when hypocholesteraemia was very pronounced the urea titre was considerably increased.

ii. Details are given of 7 cases of blackwater fever in which serum cholesterin estimations were made either during the disease or shortly afterwards. These observations show that the cholesterin titre does not always follow the course described by FEYTE, viz., hypocholesteraemia during the acute stage, an increase of the titre at the beginning of convalescence and a hypercholesteraemia at the time of recovery.

W. Y.

VALCKE & BOURGUIGNON. Contribution à l'étude du traitement de la fièvre bilieuse hémoglobinurique. [**Treatment of Blackwater.**]—*Bull. Méd. du Katanga.* 1932. Vol. 9. No. 6. pp. 156, 159–160, 162–165.

Brief clinical details are given of two cases of blackwater fever. In the first the blood was negative; the urine gradually decreased in amount, anuria set in and the patient died. In the second the blood contained parasites, the urine was plentiful and the patient recovered. Both patients were given biocholine.

The authors write that as the result of their experience of the last twelve years they give quinine in blackwater only if the blood contains parasites or if, after cessation of the blackwater, fever suggestive of malaria makes its appearance. In the second of the above cases they gave three doses of 0·15 gm. of quinine 6 days after the urine had cleared; this was followed by haemoglobinuria which lasted a couple of days. The persistence of slight fever and general debility due to extreme anaemia suggested the necessity for a blood transfusion. This,

which was performed 17 days after the disappearance of blackwater, was followed by a violent reaction and a recrudescence of haemoglobinuria. Ultimately, a course of liver extract was given and the patient recovered. *W. Y.*

BANERJEE (N. G.) & BRAHMACHARI (Phanindranath). **The Occurrence of Haemoglobinuria during Treatment of Malarial Fever with Atebrin and Plasmoquine.**—*Indian Med. Gaz.* 1933. Mar. Vol. 68. No. 3. p. 149.

Clinical details are given of a case of blackwater fever in which the following points are considered worthy of note :—

1. No haemoglobinuria developed when the patient was under treatment with quinine.
2. An attack of haemoglobinuria occurred when the patient was being treated with atebrin and plasmoquine.
3. The administration of the above drugs failed to avert an attack of haemoglobinuria. *W. Y.*

WAKEMAN (A. Maurice), MORRELL (Clare A.), EISENMAN (Anna J.), SPRUNT (Douglas L.) & PETERS (John P.). **The Metabolism and Treatment of Blackwater Fever.**—*Amer. Jl. Trop. Med.* 1932. Nov. Vol. 12. No. 6. pp. 407–439. [32 refs.]

The work described in this paper is based on observations of two cases of blackwater fever studied at Lagos [see this *Bulletin*, Vol. 26, p. 1015 ; Vol. 28, p. 13] on two cases of haemoglobinuria from other causes and on experimental observations on five dogs. The following summary is given :—

" The general similarity of the functional disturbances seen in the cases of tropical blackwater fever, hemoglobinuria from other causes and the experimental hemoglobinuria produced in dogs by transfusion with their own laked blood, indicate that both clinical symptoms and pathological lesions are essentially referable to intravascular hemolysis. This view is supported by pathological evidence secured from post mortem examinations of human cases and of the dogs used in these experiments.

" Anuria and lesser grades of renal functional impairment seem to be referable primarily to occlusion of the renal tubules with coagulated blood pigment debris. Actual cellular injury appears to play a minor part. The functional disturbances which attend the initial phase of the disease, vomiting and shock, provide conditions peculiarly unfavorable for the secretion of urine and, therefore, may play an important secondary rôle in the production of anuria or oliguria. The shock is seen only in severe cases with massive hemolysis and may well be quite similar in its origin to that following hemorrhage. The logical therapeutic procedure would seem to be early blood transfusion, where this is not precluded, as it was in case A-5680, by the appearance of abnormal blood agglutinins. Transfusions have already been recommended and utilized with some success.

" The initial vomiting, like the chill and temperature, resembles the symptoms that follow intravenous injections of any foreign protein. The cause of the subsequent vomiting is not clear. The result of emesis is, however, inevitably to deplete the salt and water stores of the body and thereby to diminish the materials required for the production of urine. The rational way to meet this situation would seem to be the parenteral administration of glucose and saline solutions. Such measures may, however, fail to achieve their purpose if the vomiting is permitted to continue. Oral administration of fluids, in the face of vomiting, may only wash more salt from the body. The withdrawal of all fluids by mouth and

the substitution of parenteral saline and glucose solutions may, in these circumstances, put an end to vomiting, restore the body fluids to their proper composition and, by providing conditions more favorable to urine formation, accelerate the return of normal renal function and recovery.

"The actual effects of the intravascular hemolysis appear to be extremely transitory. Even without the intervention of the kidneys, in cases with the most massive hemolysis, both the pigment and the protein radicles of the released hemoglobin are removed from the blood with the greatest rapidity. This affords a further reason for believing that early treatment by transfusion and infusion, might, by preventing suppression of urine and minimizing impairment of renal function, eliminate the later secondary effects of the disease.

"No support has been found for the theory that acidosis occurs in blackwater fever to offer an indication for alkaline therapy. The administration of bicarbonate in the cases described led to the development of alkalosis. In the more severe cases the alkali reserve was already somewhat above normal, before bicarbonate was given, presumably as a result of vomiting. Baker and Dodds, in experimental studies of hemoglobinuria, in rabbits, find that in an alkaline urine hemoglobin remains unprecipitated and unchanged, while in a highly acid urine (pH$<$ 5·8) it is converted to methemoglobin and is precipitated if the salt concentration in the urine is excessively high. These observations have been cited as new support for alkaline therapy and do afford a more rational basis for this mode of treatment than the acidosis theory did. They also seem to offer an argument against the use of excessive amounts of salt solution. It must be borne in mind, however, that the patient with extreme base depletion from vomiting will excrete an acid urine, even when the serum bicarbonate is extremely elevated and that the administration of sodium chloride will, in this case, render the urine alkaline. Furthermore, the urine after excessive vomiting contains minimal amounts of sodium chloride and the urinary concentration of this salt is not greatly increased by the administration of enough sodium chloride to restore the normal concentration in the serum. Finally dilution of the hemoglobin in the urine by the provision of a large urine volume may more than offset the effects of both reaction and salt concentration." *W. Y.*

BETTENCOURT-GOMES (S. C.). **Blackwater Fever.**—*Brit. Guiana Med. Ann. for 1932.* pp. 148–155.

A general account which requires no special notice. *W. Y.*

VAN SLYPE (W.). A propos de la fièvre bilieuse hémoglobinurique.—*Bruxelles-Méd.* 1933. Mar. 5. Vol. 13. No. 18. pp. 493–501. [47 refs.]

UJLAKI (P.). Over de therapie van zwartwater koorts.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1932. Oct. 25. Vol. 72. No. 22. pp. 1537–1539.

PLAGUE.

HIRST (L. Fabian). **A Rat-Flea Survey of Ceylon with a Brief Discussion of Recent Work on Rat-Flea Species Distribution in Relation to the Spread of Bubonic Plague in the East Indies.**—*Ceylon Jl. Sci.* (Sect. D. Med. Sci.) 1933. Feb. 1. Vol. 3. Pt. 1. pp. 49–113. With 4 figs text, 2 figs. on 1 plate & 1 map. [33 refs.]

The great interest of this work for the general reader lies in the discussion and proofs of the chain of events leading up to the occurrence of plague in a human community.

Ceylon, as an island with distinctive seaboard and inland features, lends itself very well to epidemiological analysis. Plague made its first appearance in Colombo in 1914. The statement therefore, that "shortly afterwards 16 *X. cheopis* were found among 200 fleas, mostly collected from rats in what is now the plague endemic area and main *cheopis* zone," gives the clue to the author's well-reasoned argument for the rat-flea species distribution being the paramount factor governing the spread of plague. This last statement is in fact his actual conclusion. In the survey which is here recorded the island has been divided into climatic or geographical areas—the low-wet, low-dry, submontane and montane zones. The low-wet zone is fertile, prosperous and relatively free from malaria, while the low-dry zone is sparsely populated, undeveloped, covered with vast tracts of jungle and subject to a high malarial incidence. Specimens of rodents were sent in from each surveyed station and were identified as *R. rattus* of the subspecies *kandianus*, *rufescens* and *kelaarti*, *R. norvegicus*, *Gunomys gracilis* and *Bandicota malabarica*. The predominant rat species searched for fleas was *R. rattus kandianus*. A list of the fleas which have been recognized on Ceylon rats is given: *Xenopsylla astia*, *cheopis* and *brasiliensis*; *Leptopsylla segnis*; *Stivalius phoberus*, *aporus* and *ferinus*; *Seratophyllus tamilanus*; *Ctenocephalides canis*, *felis felis* and *felis orientis* and *Echidnophaga gallinaceus*.

Colombo in the low-wet zone is also the chief town of Ceylon. The facts bearing upon plague in Colombo are of the utmost importance for the whole island. Colombo has a population of 284,000 and is in regular commercial communication with plague infected regions. As there seems to be no question that grain, particularly rice, has hitherto been the chief vehicle of *X. cheopis*, the chief carrier of insect plague, it is significant that 480,000 tons of rice and 20,000 tons of other grains are imported annually, mostly from Rangoon. The links of the chain which lead up to the introduction of plague are identified one by one. Thus "it seems clear that the conditions on shipboard along tropical and subtropical routes are especially favourable to the preponderance of the plague flea *X. cheopis*" and that "of all the links in the chain of infection between Rangoon and Colombo that of the ships is the strongest *qua* the flea species factor." One result of a ship rat-flea survey was to strengthen the case for systematic deratization of vessels on tropical routes and this is a measure to which Dutch, Australian and American authorities attach great importance. Within the port of Colombo itself plague has remained endemic only in that part where demolition and reconstruction of the rat-infested buildings has proved impracticable and where in any case it would have been useless because of the underground refuge afforded by an old untrapped drainage system.

The spread of plague into the interior of Ceylon has been slow. It took four years to arrive at the Kandyan plateau and eleven more years before plague was recognized in the upper montane zone; this delay is probably to be traced to regulation of the grain trade with the interior. In the last few pages the author treats of the interpretation to be placed on the results of rat-flea surveys and makes comparison of his own with the experience in British India and the Dutch East Indies. The flea-species factor, which reduces to the prevalence of *X. cheopis* and *X. astia* respectively, applies equally well to Ceylon as to South India. A thorough-going confirmation has been obtained of the author's thesis that a "three-fold relationship exists between the distribution of *X. cheopis*, grain storage of imports and plague."

W. F. Harvey.

VAN DER WALLE (N.). De ratten en de rattenvlooien van Makassar; enkele opmerkingen naar aanleiding van de voorgekomen pestgevallen. [**The Rats and the Rat Fleas of Macassar.**]—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1932. Vol. 21. No. 4. pp. 263–276. With 2 figs. & 1 folding plan. [10 refs.] English summary.

This epidemiological study centres round the occurrence of plague in Macassar, of which the first case was observed in 1922 and the last in 1930. Here, as in other places and especially in Ceylon, a connexion is traced betweeen rice importation, the species of rat frequenting different localities and the efficiency of the flea *Xenopsylla cheopis* as a transmitter by comparison with *Xenopsylla astia.*

The rat species of Macassar are *Rattus rattus diardii*, *R. norvegicus*, *R. concolor*, *Mus musculus* and *Pachyura murina.* Plague infection was mainly observed in *R. norvegicus*, on which both *X. cheopis* and *X. astia* were found in approximately equal numbers. *R. r. diardii* furnished many more *cheopis* than *astia*, a proportion which was exactly reversed in the case of *R. concolor.* The fleas of *Mus musculus* and *Pachyura murina* were almost exclusively *cheopis* and *astia* respectively. Both rats and fleas were very differently distributed. The species *norvegicus* (sewer rat) and *concolor* are numerous in Macassar while the house rats are comparatively few. Those house, sewer and concolor rats captured in the harbour region had a higher index for *X. cheopis* than for *X. astia*, but the same rats caught in the town showed more *X. astia.* "The remarkable distribution of the two species of Xenopsylla may be explained by the presence of large quantities of rice, copra and dried fish in the harbour quarter."

W. F. H.

KOPSTEIN (Felix). De huis-ratten-fauna van Java en haar rol bij de metastatische verspreiding van de builenpest. [**The House-Rat Fauna of Java and its Rôle in the Metastatic Spread of Plague.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Feb. 14. Vol. 73. No. 4. pp. 209–227. [17 refs.]

The numbers of the various species of rats and mice, caught in houses, villages and in open country, are given in detail. No difference could be found in the rat fauna of plague-infected and plague-free villages of West Java, except for a definite increase of *Pachyura murina* the house-shrew, in plague kampongs. Little proof of contact between

the rat species of the open country and those caught within houses could be established. Up till now, except for *Rattus rattus brevicaudatus*, no epizootics have been observed outside kampongs, nor is any other species of animal than the rat known in Java to be affected by epizootics. *W. F. H.*

SOUCHARD. Contribution à l'étude de la faune des rats dans la région Saigon-Cholon. Ses rapports avec l'endémie pesteuse. [**Rat Fauna in Saigon-Cholon, Cochin China. Relation to Plague.**]—*Bull. Soc. Méd. Chirurg. Indochine.* 1933. Jan.-Feb. Vol. 11. No. 1. pp. 60–66. [17 refs.]

An investigation lasting for 12 months was carried out on captured rats into the degree and character of their flea infestation. The result was that a total of 417 fleas was collected from 486 rats, of which 462 were *R. decumanus*, thus giving a flea-index of 0·85. This is a low index even though the great majority of the fleas were *X. cheopis* and the conclusion drawn is that while the two towns Saigon and Cholon are capable of infection by plague there is little likelihood of its assuming epidemic proportions. *W. F. H.*

FRÉVILLE. Contribution à l'épidémiologie de la peste en Cochinchine. [**Epidemiology of Plague in Cochin China.**]—*Ann. de Méd. et de Pharm. Colon.* 1932. Oct.–Nov.–Dec. Vol. 30. No. 4. pp. 653–679.

A general survey is made of climatic and geographical conditions, mode of invasion and history, prophylactic measures and rats and fleas in their relation to plague in Cochin China.

The two first cases of plague to be confirmed were notified at Saigon in 1906 and occurred in immigrants who had arrived by sea. Plague cases had already occurred in neighbouring countries, 1898 in Annam, 1901 in Tonking and in Siam since 1904. The spread of plague to the provinces was slow but more or less continuous up to 1918, from which year a progressive diminution set in. In 1931 only three cases were reported and it seems reasonable to hope that plague is very near its disappearance in Cochin China. Among the factors which account for this fortunate state of affairs are that the flea is rare in Cochin China and the proportion of plague-infected rats is extremely small.

W. F. H.

WASSILIEFF (A.). Les rongeurs et les puces de la Tunisie et leur rôle dans la propagation de la peste. (II. Révision des rongeurs de Tunisie—III. Revision des puces.) [**The Rodents and the Fleas of Tunisia and their Rôle in the Transmission of Plague.**]—*Arch. Inst. Pasteur de Tunis.* 1932. Dec. Vol. 21. No. 2. pp. 298–340. With 3 text figs., 2 plates & 2 folding charts.

The author supplies a much needed key to the species of rodents found in Tunisia and reviews the fleas of that region. He furnishes useful information of the mode of examining rodent burrows and presents a theory of the epidemiology of human plague in areas where apparently no epizootic has preceded it.

In the family of the Muridae there are two subfamilies of the *Gerbillinae* and *Murinae*. The *Gerbillinae* contain the genera *Psammomys*, *Meriones*, *Gerbillus* and *Dipodillus* while those belonging

to the *Murinae* are *Arvicanthus* and *Mus*. It was found best to dig out the burrows of rodents rather than to use trapping. An occupied burrow was easy to recognize and these were quite characteristic for each species of rodent. Of the genera mentioned *Meriones shawi* predominated in the part of central Tunisia investigated and *Psammomys roudairei* in the interior to the south. This difference in fauna of the centre and the south may afford an explanation of the presence of plague in the former and its total absence in the latter. Although the fleas were collected from the rodents themselves, even larger catches were at times made from their nests, for the flea may leave the animal at the time of its departure from its burrow. A list of fleas which have been captured is given and some of these are new to Tunisia. A new genus, *Neocoptopsylla*, has been established.

The general observations with which the author concludes relate especially to the record of immigration of rodents into Tunisia from Tripolitania and to an explanation of the spread of plague. His own view is that there was not an immigration but a local and temporary increase of the rodent population. Plague seems to have entered from Tripolitania and a focus appears to have been established at Zarzis, whence it spread to the north and into the central region of Tunisia. This spread, according to Wassilieff, may have been of a passive type, either by man or by rodents whose parasites have also been a reservoir. The passage to the north probably was not by actual travelling of the rat itself, but of the rat in the baggage of nomads. If an intensive local increase of rodents is superadded to the transport of the reservoir of the virus, then the series of events which have led up, first to an epizootic and after that to an epidemic are explained. Even without an epizootic a single rodent, according to the author, may be the cause of plague, for which it is assumed that the flea ingests the plague bacillus from man and becomes the reservoir of the virus. On this hypothesis it would be possible to explain outbreaks of plague without an antecedent epizootic. *W. F. H.*

ADVIER (M.) & DIAGNE (A.). Observations épidémiologiques sur la peste à Dakar (Décembre 1932). [**Epidemiology of Plague at Dakar.**]—*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 388–389.

The occurrence of 19 cases of plague, 17 of them fatal, would not have required a note but for the fact that here was an instance which might have been claimed as interhuman infection. One family alone furnished nine cases with seven deaths. Five of these cases were bubonic and four pneumonic. The point of importance in this epidemic is that a search revealed dead rats, some of them mummified, which proved that an unsuspected epizootic had been going on for some considerable time. *W. F. H.*

ADVIER (M.). Sur l'épidémiologie de la peste au Sénégal. [**Epidemiology of Plague in Senegal.**]—*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 465–472.

Plague in Senegal has been represented as possessing peculiar characters, expressed as (1) that epidemics here develop independently of all rat infection, (2) that human plague is spontaneously recovered from in many cases, and (3) that pulmonary plague is not a serious disease and only slightly contagious. Each of these points is taken

up by the author who concludes that (1) Senegal plague is in no way peculiar, (2) a rat epizootic or enzootic precedes and gives rise to epidemic or endemic, (3) the disease is usually transmitted from the rat to man by *Xenopsylla cheopis*, and (4) the contagiousness of pulmonary plague is dependent on atmospheric conditions, being due to projection of virulent particles on the mucous membranes of eye or nose. *W. F. H.*

GIRAUD (G.). Cas de peste pulmonaire primitive à Rufisque en 1932. [**Cases of Primary Pneumonic Plague at Rufisque.**]—*Bull. Soc. Path. Exot.* 1933. Jan. 11. Vol. 26. No. 1. pp. 99–103.

The points made by the author are that pneumonic plague is probably more frequent in Senegal than has commonly been supposed. Some of his own cases have had no definite pulmonary symptoms and would scarcely have been diagnosed without the help of laboratory examination, after lung and liver puncture. All cases of rapid and sudden death, especially during an epidemic period, should be examined for the possible existence of pneumonic plague. *W. F. H.*

JORGE (Ricardo). A propos de la peste au Maroc et de la leçon de prophylaxie qui s'en dégage. [**Plague and its Prophylaxis in Morocco.**]—Reprinted from *Bull. Inst. Hyg. de Rabat.* 1932. Apr.–June. 20 pp.

Five centuries have passed since in 1415 the great King John landed as conqueror of Morocco. Plague was at the time ravaging the royal army and it is a moot point whether this was the cause of introduction of plague or whether it had been already prevalent in Morocco. By the 17th century plague had left Europe and was concentrated during the 18th century in Asia Minor, Turkey and Egypt. At the end of that century, in 1799, a terrible epidemic broke out in Morocco. Marrakesh lost 50,000 inhabitants and Fez 65,000. This was the last epidemic on a large scale to attack the old world in the West. Has plague continued to the present day in Morocco ? It would not seem probable. The natives know the disease and call it by the special name of bubonic plague. Plague had quitted Egypt, Turkey, Syria and Asia Minor by about 1844. It is unlikely that Morocco would be an exception to this general retrogression. In our own time plague made its appearance in Hong Kong in 1894 and began its pandemic career. The Moroccan epidemic is, in the author's opinion, only a regional phase of the modern plague period. He develops from this point his views on the diffusion of plague. Man or the rat each becomes dangerous as vectors once they begin to travel. New foci are created. The measures which are adopted to meet this particular danger are discussed in some detail.

W. F. H.

COLOMBANI. L'importance respective du rat et de la puce de l'homme dans les épidémies de peste au Maroc. [**The Relative Importance of the Rat and the Human Flea in Plague Epidemics in Morocco.**]—*Bull. Soc. Path. Exot.* 1933. Apr. 5. Vol. 26. No. 4. pp. 562–566.

A tendency has been noticeable recently to attribute the propagation of plague in certain regions to inter-human agency, that is to say to

the human flea. In this article, which has the authority of the Public Health Service, we have the insistence upon the essential importance of the rat, however difficult it may be in some instances to prove its connexion with an epidemic. Once started, an epidemic may be carried on by case-to-case infection, either by the human flea or by expectoration in pneumonic cases. The article concludes with the warning that although the destruction of rats is less easy than that of human fleas it is none the less indispensable. *W. F. H.*

DE VOGEL (W. T.). La vaccination antipesteuse à Java et ses résultats. [**Plague Vaccination in Java.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. Mar. Vol. 25. No. 3. pp. 451–457.

There are very few really satisfactory attempts to estimate the value of a vaccine by using it on strictly alternate cases. This is, as the author properly insists, the " only method by which a clear idea of its real efficacy can be obtained." And yet vaccines against typhoid fever, cholera and plague have been used now for some forty years. It is apt to be forgotten that a comparison of results in volunteers with those who refuse vaccination is no comparison at all. The latter do not furnish a comparable control. It is, perhaps, the inconvenience of application of this method of alternate case test which has militated against its application.

In Java, however, an opportunity arose of trying out the method as a means of estimating the value of plague vaccine on a large population in a region where the disease showed a tendency to assume epidemic form. The vaccinated persons numbered 37,224 and the unvaccinated controls 39,004, while due regard was paid to similarity of age and sex distribution. Some of the vaccine used was of the type of a bacillary suspension in salt solution but most of it was of the Haffkine type of broth vaccine. The results obtained are expressed only in terms of mortality, not of morbidity, and amounted to a reduction in the mortality of about one-half. This result was not regarded by the Public Health Authorities of the Dutch East Indies as satisfactory. It was not demonstrative of a success sufficient to convince the populace of the desirability of a measure which would have to be repeated from time to time. Also it was argued that man stands outside the cycle of infection, which is one of rat and flea concern, although he may sooner or later become a victim. A decision was come to, therefore, that it was advisable to concentrate upon the gradual reconstruction of dwelling houses in order to render them unsuitable for a continuation of contact of man and rat. This method, so far as it has been able to be applied, appears to have been successful. The chief difficulty of making it general in Java has been its expense : its applicability in other countries, where other climatic conditions prevail, is doubtful.

W. F. H.

TAYLOR (J.). **Haffkine's Plague Vaccine.**—*Indian Med. Res. Memoirs. Supplementary Series to Indian Jl. Med. Res.* 1933. Mar. Memoir No. 27. pp. vi+125. With frontispiece & 20 plates. [26 refs.]

HAFFKINE came to India originally to investigate the efficacy of cholera vaccine and later became engaged in the manufacture and application of plague vaccine. The first cases of plague in Bombay,

recognized as such, occurred in September 1896 and the first plague laboratory was started on 8th October 1896. It consisted only of one room and a corridor. From this beginning it has progressed through the stages of being the Plague Research Laboratory and the Bombay Bacteriological Laboratory to what is now the Haffkine Institute. It is becoming less and less easy to recognize these imposing buildings as the old Government House, Parel, or the plague incubating room as originally a church in the time of Portuguese sovereignty over Bombay. While the buildings devoted to bacteriology generally and plague vaccine in particular have undergone much transformation, it may be surprising to learn that the vaccine itself is very much the same as it was originally—a broth vaccine. This broth vaccine was considered to be an imperfect one by the Indian Plague Commission, on grounds which appeared perfectly sound at the time and which amounted to a declaration that the sediment was active for immunization while the supernatant fluid " does not lead to the elaboration of any substances which are capable of favourably modifying a plague attack." Experimental work has served to reverse this judgment ; it is only in very recent years, however, that studies on the antigenic constitution of the plague bacillus have thrown light upon the probable reasons for the efficacy of the fluid.

What is evidently an illustration from an old plate gives testimony to the primitive conditions under which large scale inoculation was and is carried out in India. Here can be dimly made out the doctors and their assistants, the beds which a man can easily take up and carry on his head, possibly a travellers' rest house in the background and the village folk, who by precept and example are being induced to accept inoculation. A great campaign of inoculation was launched in the Punjab in 1902 and came temporarily almost to a sudden end with what is known in the history of plague vaccination as the Malkowal disaster, when nineteen persons developed tetanus after inoculation with the contents of one bottle of the prophylactic. The explanation of the fact is to some extent still controversial, but nothing like it has occurred since, although plague inoculation has been carried out on a very large scale in India. The unfortunate event " threw a shadow over Haffkine's life and seriously affected his career." If we can, without again raising argument on the subject, derive a lesson from that event, it is that the addition of half per cent. phenol to materials for large-scale inoculation is a precaution which contributes greatly to safety of procedure and peace of mind. One result of the disaster was the invention of the Maynard apparatus for bottling vaccines, which is used in India for all the prophylactic vaccines and curative sera manufactured in government laboratories. It has not only the advantage of preservation against outside contamination but of speed in filling and it provides an easily stored sample of the contents of each plague phial. A summary of the present methods of manufacture completes the first part of this interesting history.

One most important fact both as regards the biological testing of plague vaccine and the epidemiology of the disease has emerged in the course of the manifold experiments conducted at the Haffkine Institute. The Bombay rat was found to possess a high natural immunity to plague as compared with its brother rat of Madras. The one population had for years been ravaged by the disease, whilst the other had escaped. This demonstrable immunity in an ordinarily susceptible animal, would, apart from its explanation by natural

selection, seem to offer a fascinating immunological problem for study. In fact, plague, a disease which affects animals and man alike, affords a very special field of bacteriological research. The large-scale experimental work which is recorded in this memoir is itself testimony to the recognition of this fact. *W. F. H.*

JORGE (Ricardo). *Summa epidemiologica* de la peste épidémies anciennes et modernes. [**Epidemiology of Ancient and Modern Plague.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. Mar. Vol. 25. No. 3. pp. 425–450. With 3 figs. [Refs. in footnotes.]

Much history and much theory are discussed in this communication and some quaint illustrations accompany it. Plague may be said to have exhibited two cycles in Europe. Why have there been two separate cycles and why has the return of plague in the cycle of this century been so different from the first, such an attenuated plague ? The virulence has been the same ; so also has been the symptomatology. It is the epidemicity which has altered and particularly the power of rapid diffusion. By the 18th century Europe was free from plague, which had retreated to its original fold in the Asiatic hinterland. The replacement of Venetian maritime supremacy, which occurred with the discovery of the Cape route to India, the dissolution of the Hanseatic League and the discovery of America have all a bearing on the disappearance of plague. The possibility of the vectors of plague having changed is very thoroughly considered as an explanation, and in the author's opinion this is a probable explanation of much of the difference in character of ancient and modern plague in Europe. The black rat was not introduced to Europe until after the Crusades and the brown rat not until later still. The epizoodemic theory of plague cannot be accepted as satisfactory for the genesis and propagation of ancient epidemic plague. It will explain neither the disappearance of plague from Europe nor the relative immunity of Europe in modern times. The reason for the difference is to be looked for in a change of type of transmission. Ancient plague was not, as is modern plague, a rat and rat-flea propagated plague. It was a human and human-flea transmitted plague, in which the pneumonic type was very prevalent and accounted for the rapidity of spread of old-time epidemics. The same mode of carriage may occasionally be found at the present day, nor need the human carrier himself be affected with plague, for he may be the bearer of plague fleas. Ancient plague was, then, to a very considerable extent, if not exclusively, inter-human while modern plague is bubonic and rat-borne. *W. F. H.*

HIRST (L. F.). **The Protection of the Interior of Ceylon from Plague with Special Reference to the Fumigation of Plague-Suspect Imports.**—52 pp. With diagrams & 2 plates. 1931. Colombo: Municipal Printing Office, Ceylon.

This brochure provides an excellent discussion on the introduction and propagation of plague in its relation to rats, fleas and grain, together with practical chapters on cyanide fumigation.

The objectives considered are the eradication of plague from Colombo, the protection of highland Ceylon from grain-borne plague and the protection of lowland Ceylon from further invasion. Bubonic plague is primarily a disease of rodents carried by fleas ; man himself is of

comparatively little importance in the spread. Merchandise also is not a cause of direct infection ; its rôle is, however, very important for the conveyance of plague and " is proportionate to the extent to which it has been infested by plague rats and fleas." Of all types of merchandise grain is now considered as the most important because it is a favourite food of rats and " its débris forms a suitable diet for the larvae of the plague-carrying fleas." Transference of infection overseas or overland has very definite dependence on the duration of life of the plague infected rat and the plague infected flea. A rat will usually die " within a week of being bitten by the infected flea," and it is at least safe to say that the female infected *X. cheopis* may survive at most for one week and the male for 4 days. With longer periods than this it is inferred that a plague epizootic has occurred on ship board, the link between the shore and the ship being a plague rat or more probably a plague flea. Migration of animals as a factor in the spread of plague is unimportant where rats are concerned. The imported rat *R. norvegicus* wanders further than *R. rattus* which " may explain the greater extent and persistence of plague and the more uniform distribution of the flea *Xenopsylla cheopis* in the plague endemic area in Colombo." True field rodents on the other hand, such as squirrels and gerbilles, do migrate and this may be an important factor in the spread of plague in other lands. The part played by the fleas *X. cheopis* and *X. astia* respectively is dealt with in some detail as might be expected from the pioneer work done by the author in this connexion.

Immunity of various parts of India, Burma and Ceylon is explainable on the basis of the prevalence of the efficient plague vector *cheopis* and the inefficient vector *astia*. The proper criterion of flea prevalence, as it relates to plague, is the specific flea index and not a simple flea percentage. A marked difference is naturally shown between those of the two fleas. It is between 1 and 2 for *cheopis* and nearer 7 for *astia*. These few facts, taken from a much fuller treatment of the subject, go to confirm the dictum that —" The control of the grain trade and the proper storage of grain are almost synonymous with efficient plague preventive measures." For Ceylon it is rice that is the grain whose importation requires to be controlled. More than 70 per cent. of the enormous quantities imported to Ceylon comes from Rangoon, which was till recently the port most heavily infected with oriental plague. Bombay shares with Rangoon the distinction of being the most important external source of plague for Ceylon. The difference in seasonal incidence of plague in the several towns concerned in outgoing and incoming plague receives special consideration. In this respect human plague incidence serves as a fairly good index to the amount of rat plague existent at any given time, when due allowance is made for the fact that the maximum incidence of the epizootic is some weeks earlier than that of the epidemic. The length of the voyage between Rangoon and Colombo is just about two days too long for direct transference of infected fleas and it is obvious therefore that if the grain carrying ships between these two ports are kept free from rats they will not carry plague. Danger lies in the occurrence of a plague epizootic among the ship rats. Climate is another important factor in the spread of plague. Thus *X. cheopis*, the plague carrying fleas, will not transmit plague when the mean temperature exceeds 80°F. and this applies to Colombo and the low-country of Ceylon for many months of the year. On the other hand in Kandy and other highland stations plague might spread at almost any time of the year.

All these considerations, of which merely mention has been made, will be found exceedingly helpful to the medical officer in all lands who is concerned with the prevention of entry of plague to a port and its spread to the interior. The treatment of the subject of cyanide fumigation as given by the author will also repay perusal. *W. F. H.*

ADVIER (M.). Etude d'un bactériophage antipesteux. [**Study of a Plague Bacteriophage.**]—*Bull. Soc. Path. Exot.* 1933. Jan. 11. Vol. 26. No. 1. pp. 94–99.

The points studied are, (1) the range of action and potency of isolated phage for various strains of *Past. pestis*, (2) duration of preservation, (3) the use of this bacteriophage in infected animals and in man.

The bacteriophage was isolated from the blood of a patient in Senegal, whereas those of other workers have been isolated from stools or from sewage. Lytic potency was fully preserved for 8 months at laboratory temperature. In no case was a secondary culture observed. Forty-seven strains of plague bacilli, all of different origin, were subjected to the action of the phage and all were lysed. No lyso-resistant strain has yet been met with. This phage appeared to have a high degree of specificity, for it was inactive against *Bact. coli*, other intestinal organisms and even against *Past. pseudotuberculosis rodentium*. If an agar surface were treated with the bacteriophage it ceased to be able to grow *Past. pestis* while still continuing favourable to the growth of other germs. This may afford a method for diagnosis of plague or the plague bacillus. Experiments to test prophylactic and therapeutic action in infected animals were all failures and there seemed even to be some indication of sensitization. Trials in man were not sufficiently numerous or definite to permit of precise conclusions. Thirty-five cases of bubonic plague treated by bacteriophage furnished 20 recoveries and, where the plague bacillus was isolated from blood or gland juice, it was always lyso-sensitive to the phage used. *W. F. H.*

BONCINELLI (Umberto). Studio su un germe del gruppo Pasteurella, isolato del ratto bianco. [**Study of a Pasteurella of the White Rat.**] —*Boll. Istituto Sieroterap. Milanese.* 1932. Dec. Vol. 11. No. 12. pp. 834–854. With 2 figs. on 1 plate. [95 refs.] German summary.

The organism was isolated from a spontaneously affected rat. In its characterization it is allotted a position intermediate between *P. pestis*, *P. pseudotuberculosis rodentium* and *P. pluriseptica*. The author discusses its relationship to plague-like organisms in general and the significance of these organisms for the epidemiology of plague.

W. F. H.

WEBSTER (W. J.). **Notes on Indian Plague Rats.**—*Indian Med. Gaz.* 1933. Apr. Vol. 68. No. 4. pp. 214–216. [10 refs.]

These notes should prove useful to those for whom they are intended —" health officers and others who have to deal with plague outbreaks."

One source of confusion in the literature of plague is due to the frequency of change of nomenclature. The genus "Mus" of Linnaeus (1758) referred to rats, mice, and other rodents such as guineapigs. An example of the way in which nomenclature has altered is afforded by the long-tailed house rat, which by virtue of " its numerical density,

wide distribution and domestic habits, coupled with its specific flea infestation . . . is by far the most important species of rat as far as plague in India is concerned." This rat was first known as *Mus rattus*, then as *Epimys rattus* and is now named by English-speaking naturalists *Rattus rattus*. It is sometimes referred to as the black rat but it may be brown in colour and the so-called brown rat (*Rattus norvegicus*) may be black, while either may be grey. A useful table is given of characters distinguishing the genera, *Rattus*, *Bandicota*, *Gunomys* and *Nesokia*. The last three should at least be recognized and distinguished from *R. rattus* and *R. norvegicus*. Some of the distinguishing characters of mice of the genera *Mus*, *Leggada* and *Legadilla* are also given. *W. F. H.*

MICHELETTI (Ettore). Sulla diagnosi della peste murina. [**Diagnosis of Rat Plague.**]—*Ann. di Med. Nav. e Colon.* 1932. Nov.–Dec. 38th Year. Vol. 2. No. 5–6. pp. 677–687.

The importance of the diagnosis of plague in the rat is well recognized and there is often difficulty in making it with dead animals in a state of decomposition. Methods have been devised to overcome this difficulty. If spleen smears, fixed in methyl alcohol, are treated for at least half an hour, and better still for longer, with a-naphthylamine solution, the plague bacilli present their typical bipolar character. It is also extremely useful, especially in decomposed animals, to make diagnostic cultures from the bone marrow, because in this way pure growths may be obtained. Bone-marrow smears are also preferable, for the same reason, to those from the spleen. To obtain the most rapid development of the cultures the author uses a nutrient bouillon composed of 1 cc. grain infusion to 5 cc. broth. The well known chain growths of the plague bacillus are obtained by sowing in liver broth. By incubation at 30°C. instead of 37°C. for 48 hours it is possible to avoid the appearance of involution forms and to maintain the virulence unchanged. Even in ordinary nutrient bouillon the plague bacillus produces a certain amount of nitrous acid. This production of nitrous acid—and no culture can be called plague which does not produce it—may be increased by the use of special media. A positive result is obtainable with old cultures, as well as from recently isolated strains.

W. F. H.

KONSTANSOFF (S. W.). Latente und chronische Formen der Zieselpest im Zusammenhang mit der epidemiologischen Beleuchtung der Zieselpest-Epizootien. [**Latent and Chronic Forms of Ziesel Mouse Plague, their Significance for Ziesel Plague Epizootics.**]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Feb. 23. Vol. 127. No. 7/8. pp. 440–450. [27 refs.]

The ziesel-mouse epizootic of 1930 in the Ural region was strikingly peculiar because (*a*) the disease was not fatal, (*b*) there was no transmission to man and, (*c*) it showed a latent chronic form of infection without a single observed case of acute infection. Enlargement of external glands was insignificant. No symptoms of disease were manifest. One or more small nodules were found in the spleen and liver and cultures made from nodule-containing organs provided a pure culture of ovoid bacteria similar in morphological and cultural characters to *Past. pestis*. Guineapigs were inoculated subcutaneously with the organs of the ziesel mouse or infected by rubbing an emulsion

of the organ on the scarified skin. They died in 5 to 5½ days with the symptoms of a plague infected animal, typical bipolar bacilli in the blood and small necrotic foci throughout the spleen and liver. More common than this type of infection, however, was a chronic one, developing in 10 to 12 days, with suppuration at the site of inoculation, purulent buboes and large caseous masses in kidneys, lungs and liver. Smears from the caseous masses showed only involution forms but cultures were quite typical. When a cutaneous instead of subcutaneous method of infection was adopted, either the animal developed no infection at all or was temporarily indisposed and showed post mortem a chronic type of infection.

The explanation of this epizootic may take two forms: either it is a disease *sui generis* or it is true plague of very little virulence for rodents and none for man. Such explanations are of high importance for the epidemiology of plague. According to the author "the conditions of transmission of plague infection at the time of an epidemic and the mode of spread of an epidemic are not yet really known. Fleas and other biting insects are only rare and accidental vectors and play no actual part in the spread of plague." That "the part played by rodents in the epidemiology of plague is not one of propagation of infection is demonstrated by (1) the existence of epizootics without simultaneous epidemics, (2) the development of plague epidemics without participation of rodents, (3) the not infrequent absence of any parallelism between the curves of the plague epidemic and the plague epizootic, and (4) the want of coincidence between the beginning and end of epidemic and epizootic."

What the author, holding these special views, considers is now necessary is to investigate the latent and chronic forms of plague in animals, and especially to carry out cross immunization experiments with the bacilli of plague in the ziesel mouse and the bacilli of human plague.

W. F. H.

JAN-KERGUISTEL (A.). Note sur une épidémie de peste pulmonaire survenue en saison chaude à Tamatave. [**A Hot-Weather Epidemic of Pulmonary Plague in Tamatave, Madagascar.**]—*Bull. Soc. Path. Exot.* 1933. Jan. 11. Vol. 26. No. 1. pp. 5–6.

The peculiarity of the outbreak, which was proved bacteriologically and attacked four persons in all, was its occurrence during the hot season.

W. F. H.

KNIGHT (H. W.). The History of Bubonic Plague and Personal Experiences.—*New Orleans Med. & Surg. Jl.* 1933. Mar. Vol. 85. No. 9. pp. 672–678. With 3 figs.

LU (T. H.). The Plague Epidemic of 1931 in Shansi and Shensi Provinces (China).—*Jl. Oriental Med.* 1933. Feb. Vol. 18. No. 2. [In Japanese. English summary p. 19.]

PONS (R.). Au sujet de la communication de M. Advier: "Etude d'un bactériophage anti-pesteux."—*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 385–387.

CHOLERA.

CHAN (Eugene) & YANG (Neo Karl). **Cholera in Shanghai.**—*Jl. Philippine Islands Med. Assoc.* 1933. Mar. Vol. 13. No. 3. pp. 162–168. With 2 diagrams.

In this study we find a disclaimer of the possibility of cholera being endemic in China. Two cholera epidemics have been observed, one in 1930 and one in 1931. Owing to the very efficient examination of stools instituted in Shanghai it has been possible to follow these epidemics from the first case to the last and they are set out very clearly week by week as frequency distribution curves.

This distribution was, for the 1930 epidemic beginning on 28th August and ending on 18th October, 3, 10, 18, 20, 18, 8, 6, and 4, a range of 8 weeks in all. In 1931 the epidemic was very similar with a longer duration. Details were given also of the age, sex, and social status distributions of the cases. Cholera vaccine had been used preventively before the occurrence of the epidemics and none of the immunized persons is known to have been attacked with cholera.

W. F. Harvey.

KUROYA (Masahiko) & OSHIO (Kempu). **On the Types of Cholera Vibrio of the Shanghai Epidemic of 1932.**—Reprinted from *Bull. Shanghai Sci. Inst.* 1932. Oct. Vol. 2. No. 1. 10 pp.

The types of the authors are referable to vibrios, of which initially the " original type " (Inaba) was a virulent and epidemic strain and the " variant type " (Ogawa) a weakly virulent sporadic strain. A " middle type " (Kikojima) falls between the original and variant types. The fifteen strains investigated were obtained at the early period of the 1932 epidemic and subjected to agglutinin-absorption tests. Twelve of these were of " variant type " and three, although primarily of variant type, approximated to the so-called " middle type."

W. F. H.

SHODA (T.), KOREYEDA (T.), KODAMA (T.), OKAMOTO (K.) & OTOMO (T.). **Bacteriological Examination of Cholera Vibrio conducted at Kobe Port in 1932 during a Period when Several Foreign Ports were designated as Cholera-infected Places.**—*Jl. Public Health Assoc. Japan.* 1932. Dec. Vol. 8. No. 12. pp. 1–6.

Passengers and crews arriving at Kobe from infected ports had their stools examined for the detection of cholera carriers. This rule applied to steerage passengers and subordinate crews, seldom to cabin passengers and ships' officers. During a period of 150 days 21,916 persons in all were examined by a simple peptone water culture technique in the first instance and three definite cholera carriers were found. Apart from the three definite cases 196 others were investigated further and 11 cholera-like vibrios isolated. Ten of these were quite negative to cholera agglutinating serum while one exhibited a co-agglutination effect.

W. F. H.

SHAHIN Pacha (Mohammed). L'examen bactériologique des selles des pèlerins égyptiens, pour l'année 1932, à leur départ d'Egypte et à leur retour du pèlerinage. [**Examination of Pilgrims on Departure and on Return for Cholera.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. Jan. Vol. 25. No. 1. pp. 85–86.

The stools of 1,532 pilgrims were examined before departure and were entirely negative. On their return journey at Tor the stools of 2,262 were examined, two of which furnished agglutinable vibrios and six non-agglutinable vibrios. The agglutinable vibrios were found in the first case in a pilgrim whose stools had not been examined before he set out and in the second case in a collective tube of ten stools, but with negative result upon examination of the individuals singly.

W. F. H.

JUDE & MILLISCHER. La protection des états sous mandat français contre l'épidémie de choléra qui a sévi en Irak dans l'été 1931. [**The Protection of French Mandated Territories against Cholera in Iraq.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. Jan. Vol. 25. No. 1. pp. 74–84. With 1 chart.

The first two parts of this article deal with the measures taken and bacteriological observations [*ante*, p. 170]. The third part deals with the difficulties of application of the International Sanitary Convention.

The Baghdad-Damascus route is of great importance and Baghdad is in direct communication by rail with Basra and the Persian Gulf, which are regular foci of cholera. It was an embarassing situation for the sanitary authorities at Damascus to find a high proportion of carriers of agglutinable cholera vibrios among travellers, all of whom had been vaccinated. Some of these were of high social position and came from Baghdad where no case of cholera had been reported. The pronouncement of the Committee of the International Office of Public Hygiene of May 1931 seemed to be applicable :—" Healthy carriers of cholera vibrios ought to be considered no less a danger. . . . Vaccination appreciably diminishes the risk of importation of cholera but does not banish it entirely." A decision was then made to submit all travellers without distinction to examination of their stools. It is to be hoped that in case of a new epidemic, investigation for healthy carriers will be practised on a large scale, if not for prophylactic, at all events for scientific purposes. *W. F. H.*

MORGAN (M. T.). Sur la signification des porteurs sains de vibrion cholérique et sur les effets de la vaccination anticholérique parentérale sur les vibrions de l'intestin. [**The Significance of Healthy Cholera Carriers and the Effect of Parenteral Vaccination on Vibrios.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. Jan. Vol. 25. No. 1. pp. 89–94.

A number of questions are asked in this article, evidently for the purpose of urging the necessity to provide answers.

The serum of healthy carriers does not show more antibody content than that of the normal individual. Have specific antibodies little or no effect on the causative organism contained in the intestine of a healthy carrier and is this due to the interposition of an immune barrier ? Can healthy carriers be sterilized ? Recent work would seem to show that this can be done—by bacteriophage at Tor and by

ingestion of anticholera vaccine in Syria. Anticholera vaccination only affords an appreciable immunity by the 9th or 10th day after the first inoculation. If then such vaccination is of prophylactic value for the individual detained in quarantine, is it justifiable to permit his release before the 5th day? Experience so far obtained seems to indicate that it is not advisable to be too active in regarding healthy carriers as a very great danger. Investigations of such points as these is very important for the present day traveller or pilgrim. *W. F. H.*

BIFULCO (Carlo). Patogenesi del colera asiatico. Nota II. Genesi dei portatori di vibrioni colerigeni. [**Pathogenesis of Cholera. Cholera Carriers.**]—*Riforma Med.* 1933. Apr. 1. Vol. 49. No. 13. pp. 478, 481–483.

In the author's first note (*ante*, p. 170) it was contended that the cholera syndrome is brought about by the arrival of a sufficient dose of vibrios, via the portal system at the liver, their exaltation in the liver, and their arrival in the intestine by way of the bile. This explanation, which is supported by experimentation in the rabbit and now in the dog, is to some extent that of SANARELLI—the penetration of the mucous membrane of the mouth by the cholera vibrio and its arrival *a tergo* by the circulation at the intestine and at the liver. The presence of vibrios in the gall bladder is not due to an ascent from the intestine and multiplication in the bile. Infection of the liver is a primary condition, while that of the intestinal contents is secondary. Elimination of cholera vibrios in convalescence or later will depend on the condition of the liver which may be greatly injured in cholera. The slowness of repair in the liver may be the explanation of the duration of persistence of the carrier state. A healthy carrier would be an individual in whom a dose of vibrios had arrived at the liver which was insufficient to produce the cholera syndrome; the vibrios then would not have their virulence exalted by the liver and would produce no symptoms. This would also serve to account for the fact of less virulence and less persistence of the vibrios in the healthy carrier than those of the cholera case or of the convalescent. *W. F. H.*

BERNARD (P. Noël) & LIANG (Wang). Remarques sur quelques souches de vibrions cholériques isolés en Indochine et sur les variations de leurs caractères sous l'influence du bactériophage. [**Variations in Some Cholera Vibrio Strains of Indo-China induced by Bacteriophage.**]—*Bull. Soc. Path. Exot.* 1933. Feb. 8 & 9. Vol. 26. No. 2. pp. 146–151.

These authors have applied themselves to a confirmation of the results obtained with bacteriophage by DOORENBOS (this *Bulletin*, Vol. 29, p. 682). Sixteen strains of vibrio having all the classical characters of cholera were at their disposal. These were agglutinable, non-haemolytic and sensitive to bacteriophage.

One of these strains was taken and subjected to the action of phage, which cleared it completely. A secondary culture appeared 24 to 48 hours later and was sown on gelatin agar. It was this secondary culture which formed the object of study. The original pure strain, not acted on by bacteriophage, agglutinated in 2 hours at 1 in 4,000, showed haemagglutination with the erythrocytes of horse, sheep and guineapig and was very sensitive to bacteriophage. The secondary culture on the other hand only agglutinated at 1 in 500 after 24 hours,

gave haemagglutination, and was only partially lysed by bacteriophage, a lysis too which was quickly followed by secondary culture. Other characters of the secondary strain were that bouillon and peptone water cultures were less abundant, the pellicle less well developed, colonies on agar more dry, less transparent and sometimes wrinkled. The proteolytic power was diminished.

A series of cultures on gelatin agar at intervals of 24 hours was now made of the bacteriophage-modified strain and a gradual return to the characters of the original strain was obtained after the seventh subculture. All the other strains in the authors' possession were tested out in this way; some did and some did not undergo the modification described. *W. F. H.*

BERNARD (P. Noël) & GUILLERM (J.). Sur la lyse transmissible du vibrion cholérique. [**Transmissible Lysis of the Cholera Vibrio.**]—*C. R. Acad. Sci.* 1933. May 1. Vol. 196. No. 18. pp. 1339–1341.

By the use of a technique for extraction of diastases the authors have obtained an amorphous powder capable of giving rise to transmissible lysis.

They counter the objection, which was certain to be advanced, that such a powder might contain no more than a single living corpuscle of d'Herelle, and yet be able to bring about transmissible lysis, by using a 24 to 48-hour bouillon culture containing no lytic principle. Such a culture is treated with the gel of orthohydroxide of aluminium to obtain on the one hand a bouillon exhausted by adsorption and on the other a liquid obtained by washing (elution) the gel in distilled water of pH 7. Both these liquids, after concentration, treatment with saturated ammonium sulphate and centrifugation, give precipitates which are dried. These powders are very unstable and must be used immediately after dilution in bouillon of pH 7. The colloidal solutions obtained show, with young cultures of the vibrio from which they were derived, a transmissible lytic power, weak to begin with, but becoming enhanced with passage. Of the two fluids treated it is the exhausted bouillon which contains most of the lytic substance, and this fact leads the authors to the view that the aluminium gel does not adsorb the lytic principle, although some of it is mechanically carried down. Adsorption, therefore, removes impurities and leaves the lytic principle behind, which would make the procedure adopted comparable to the adsorption of proteolytic pancreatic enzymes by aluminium gel to leave behind a purified trypsin in the mother liquor. *W. F. H.*

MICHELETTI (Ettore). Ricerche sulla pluralità dei tipi sierologici del vibrione colerico. [**Plurality of Serological Types of the Cholera Vibrio.**]—*Ann. di Med. Nav. e Colon.* 1933. Jan.–Feb. 39th Year. Vol. 1. No. 1–2. pp. 23–34.

In Japan two types of cholera vibrio have been isolated in epidemics, called the typical and the atypical, with agglutination titres respectively of over 1 in 6,000 and up to 1 in 400 only. The El Tor vibrio is included among the atypical.

In this investigation the author deals with the problem of the existence of a single serological type for the cholera vibrio. Eleven strains were collected, of various origin, one of which was an El Tor vibrio from a carrier. All these strains were positively agglutinated by the

laboratory serum (titre 1–10,000) in the dilution 1 in 8,000. The research consisted in a cross agglutination test of each strain by each of the sera belonging to each strain. As a conclusion the author affirms the unity of type of the cholera vibrio. In the absence of a definitely standard cholera serum it should be justifiable in practice to take the agglutinating vibrio as a cholera vibrio and the non-agglutinating as not a cholera vibrio. *W. F. H.*

GHOSH (H.). Préparation de la toxine cholérique. Action pathogène expérimentale. [**Preparation of Cholera Toxin ; Pathogenic Action.**]—*C. R. Soc. Biol.* 1933. Apr. 1. Vol. 112. No. 12. pp. 1176–1177.

This record is of the growth of a strain of cholera anaerobically in Martin's peptone bouillon of pH 8. An intravenous injection of 2·5 cc. filtered 20-hour culture in a fasting rabbit produced extreme thirst in 2 or 3 minutes and extreme exhaustion in 2 hours. Recovery took place by degrees. An injection of 0·75 cc. is made 4 hours later and repeated next morning. " If the characteristic diarrhoea did not occur overnight, it was certain to appear within 30 minutes after the third injection." The toxin is precipitated by ammonium sulphate, furnishes in the rabbit an agglutinating serum of a titre 1 in 5,000, and is destroyed by heating 30 minutes at 100°C. *W. F. H.*

BRAULKE (Hellmut). Form- und Wachstumsveränderungen bei Vibrionen. [**Form and Growth Changes in Vibrios.**]—*Ztschr. f. Hyg. u. Infektionskr.* 1933. Apr. 8. Vol. 115. No. 1. pp. 25–46. [11 refs.]

In the past fifty years there have been many attempts to describe not merely variability but a much wider range of variation in the forms of bacteria. Such variations have been designated pleomorphism, cyclogeny, etc. In a recently promulgated theory of dimorphism, the B-form to which all rod-shaped bacteria belong is said to be able to go over to a C-form, of coccus type and this latter is capable of cultivation. Not only so, but in a pure culture of bacteria protozoa-like organisms may emerge from the bacteria, with which they have been living in symbiosis. These new organisms have been called " Pettenkoferia."

The author has occupied himself largely with the action of lithium chloride upon vibrios in his treatment of these views and has come to the following conclusions :—1. The so-called " Pettenkoferia " organisms are giant or irritation forms of growth of bacteria which have developed as the result of pathological changes brought about by the action of salts such as lithium chloride. 2. The habituation of vibrios to a lithium chloride containing medium can be so complete that a quite normal growth results. When these lithium-accustomed bacteria are weaned from their new medium and returned to normal media they pass through the same series of abnormal forms before becoming normal again. 3. The granules which develop out of vibrios are not capable of further development and are not to be regarded as gonidia, nor are the cultures which contain them filtrable. 4. Processes, however, have been observed in old cultures which to some extent correspond to an attempt at sexual propagation. 5. The C-forms of gram-positive coccus culture type, which have been described as arising from all bacillary forms, are nothing but latent contaminations.

6. Forms of vibrio are described which are astonishingly like protozoa.
7. Longitudinal division of vibrios is described as undoubtedly occurring. *W. F. H.*

LINTON (Richard W.) & SHRIVASTAVA (D. L.). **Carbohydrate Fractions from *Vibrio cholerae*, and Related Organisms.**—*Proc. Soc. Experim. Biol. & Med.* 1933. Feb. Vol. 30. No. 5. pp. 600–603.

In this study of the important carbohydrate composition of bacteria of the vibrio group three fractions were separated by alcohol precipitation from the ultimate hydrolysate obtained.

Fraction I is a dark reddish gum. Fraction II was the same in all the vibrio strains studied and " appears to consist of glycuronic acid and galactose." The third fraction, left behind in the hydrolysate, is a single sugar—galactose for (1) a smooth agglutinating vibrio recently derived from a case of cholera, and for (2) a rough, non-agglutinating strain derived from the above by the action of bacteriophage ; arabinose for (3) a rough, weakly agglutinating strain, and for (4) a water vibrio, smooth and non-agglutinating. So far then it would appear that " the chemical difference between the specific substances of the pathogenic vibrio and the water vibrio lies in the possession of galactose by the first and of arabinose by the second " and that " the smooth-rough transition brought about by bacteriophage action does not change the character of the carbohydrate nor does the change from the agglutinable type have any effect upon the specific substance." *W. F. H.*

LIU (S. H.), WANG (S. H.) & FAN (C.). **Acidosis in Cholera. I. Path of Displacement of Serum Acid Base Equilibrium. II. Changes in Serum Electrolytes.**—*Proc. Soc. Experim. Biol. & Med.* 1933. Jan. Vol. 30. No. 4. pp. 417–418 ; 419–420.

These two studies deal with the biochemistry of the blood in cholera. In the acute stage acidosis was always present and the values of serum pH, bicarbonate content and CO_2 tension were 7·28, 14·1 and 30·7 respectively. These are to be compared with the normal values of 7·40, 26·6 and 44·9. Intravenous saline or alkaline therapy brought the pH back fairly rapidly to normal and this was followed by the return of bicarbonate. During convalescence a tendency to alkalosis developed. In the acute stage " besides decrease in pH and bicarbonate content, there is a distinct reduction in serum total base and chloride concentrations and an elevation of phosphate, lactate and to a lesser extent proteins." *W. F. H.*

DEL FAVERO (Ernesto). Sul comportamento del vibrione colerigeno di fronte a temperature elevate. [**The Action of High Temperature on the Cholera Vibrio.**]—*Arch. Ital. Sci. Med. Colon.* 1933. Jan. 1. Vol. 14. No. 1. pp. 47–50. With 2 figs. English summary (7 lines).

The cholera vibrio after fifteen days of subculture at an elevated temperature loses its virulence for the rabbit. It is possible, however, to restore this virulence by a series of passages. Originally the strain of vibrio in the author's possession was capable, when one loopful of culture was injected directly into the small intestine, of producing convulsions, collapse and death in about 24 hours. This virulence was lost after serial cultivation at 41°C. By five passages in rabbits

the virulence was once more restored. With cultivation of the vibrio at 41°C., another property was acquired, that of resistance to the lethal effect of a high temperature. Thus the normal vibrio kept for 5 minutes at 52°C. gives a scattered growth, while the vibrio which has become habituated to a temperature of 41°C. gives a confluent growth.

W. F. H.

ALOMIA (Angel). Brief Report of Cholera Epidemic in Daram Island, Samar.—*Monthly Bull. Philippine Health Serv.* 1932. Dec. Vol. 12. No. 12. pp. 696–703.

FUENTES (L.). Cholera Outbreak in Barrio San Roque, Lingig, Surigao, February–March, 1930.—*Monthly Bull. Phillippine Health Serv.* 1932. Mar. Vol. 12. No. 3. pp. 89–93. With 1 map.

FUENTES (L.). Cholera Epidemic in Hinatuan, Surigao, from August to September, 1930. *Monthly Bull. Philippine Health Serv.* 1932. Mar. Vol. 12. No. 3. pp. 94–106.

LING (Chao-Chi). Cholera Bacteriemia in a Case of Typhoid Fever.—*Chinese Med. Jl.* 1932. Nov. Vol. 46. No. 11. pp. 1092–1095. [13 refs.]

MAGHERU (Georges), MAGHERU (Alice) & MIHAILESCU (G.). L'action du goudron sur le vibrion cholérique.—*C. R. Soc. Biol.* 1933. Jan. 13. Vol. 112. No. 1. pp. 88–90.

NOBÉCHI (Keizo). Les types immunologiques du vibrion cholérique au Japon. *Bull. Office Internat. d'Hyg. Publique.* 1933. Jan. Vol. 25. No. 1. pp. 72–73.

TOOTELL (George T.). Choleraic Diarrhoea. Notes from a Station Hospital.—*Chinese Med. Jl.* 1933. Jan. Vol. 47. No. 1. pp. 58–60.

TSURUMI (Mitsuzo). Porteurs de germes du choléra.—*Bull. Office Internat. d'Hyg. Publique.* 1933. Jan. Vol. 25. No. 1. pp. 87–88.

BERIBERI AND EPIDEMIC DROPSY.

NICOLLE (G.). Au sujet d'une poussée épidémique de béribéri dans les troupes indigènes. [**Beriberi in Natives at Dakar.**]—*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 507–512.

ROBERT (Léopold), LONG, FEYTE & DAREYS. Une épidémie de béri-béri à forme humide observée à Dakar en 1932.—*Ibid.* pp. 512–516.

LAMBERT (L.). Y a-t-il une épidémie de béri-béri dans la population indigène de Dakar.—*Ibid.* pp. 516–518.

ADVIER (M.). Sur la bactériologie du béribéri.—*Ibid.* pp. 518–519.

An entire session of the Medico-Chirurgical Society of West Africa was devoted to an epidemic of beriberi observed in Dakar during 1932. The wet form of the disease, with gastro-intestinal and myocardial lesions predominating, comprised nearly all the cases. The mortality was relatively high because slight cases may have been classified under other heads.

The following is a brief summary of the papers :—

(1) G. NICOLLE.—Epidemiological studies of 33 beriberi cases, with 10 deaths, occurring among indigenous soldiers. Rice constituted 37 per cent. of the local diet, while that given in France had only 25 per cent. of rice. This excessive quantity of rice, together with the difficulty of procuring fresh food, vegetables and fruit at certain seasons, played an important part in the causation of the outbreak. Palm oil in the local diet by setting up gastric stagnation and fermentation was found to be another harmful factor. Lessening the amount of work, varying the diet especially as regards fresh fruit and vegetables and replacing $\frac{3}{4}$ of the polished rice with $\frac{1}{4}$ of red rice, proved satisfactory prophylactic measures.

(2) ROBERT, LONG, FEYTE and DAREYS.—Discussed clinical and post mortem findings. Under the former heading may be mentioned the absence of neuritis ; while in the latter sclerosis of the pancreas with firm adhesions between that organ and the duodenum is remarkable.

(3) LAMBERT.—Dealt with the presence of beriberi among the indigenous population of Dakar. During September, October and November 1932, 33 cases presenting oedema, cardiac symptoms and sluggish or absent tendon reflexes were admitted to hospital. Of these cases, 18 proved to be wet beriberi and 11 died, some of extremely sudden cardiac failure. All the patients were poor and their diet was deficient both absolutely and relatively.

(4) ADVIER.—Laboratory investigations gave no evidence of a specific pathogenic organism. *A. D. Bigland.*

FABRY. Réflexions cliniques sur 163 cas de béribéri. [**163 Cases of Beriberi.**]—*Ann. de Méd. et de Pharm. Colon.* 1932. Oct.–Nov.–Dec. Vol. 30. No. 4. pp. 694–708.

Beriberi is the result of a toxi-infection and the various forms of the disease represent different degrees of the same condition.

In 1931, 163 cases of beriberi were observed. Of these, 32 were of the wet type, 92 dry and 39 mixed. The death rate was 78 per cent. of the " wet " cases, 4 per cent. of the " dry " cases and 29 per cent. of the mixed type. Dry beriberi, chronic from the beginning, is evidently the manifestation of a slight attack ; while the wet form may arise out of this condition or begin suddenly *de novo*. A clinical unity exists

between the different forms of the disease and this view is confirmed by finding in two chronic cases a positive blood culture after " biotropisme provoqué." The organism thus isolated resembled that found in the blood of a febrile case of the wet type.

Among other observations the following may be mentioned :—Beriberi in the large majority of cases is a toxi-infection which evolves slowly and without perceptible clinical signs. This latent state may suddenly become active, particularly as a result of some other infection. Polyneuritis is often the first grave clinical sign. Even in acute cases it is extremely probable that there is a pre-existing " organic instability " and that polyneuritis and other acute symptoms are only manifestations of differing intensity of the same latent condition. Chronic avitaminosis may be associated with the toxi-infection.

A. D. B.

STEVEN (George H.). **Pathological Notes on Cases resembling Wet Beriberi occurring in British Guiana.**—*Brit. Guiana Med. Ann. for 1932.* pp. 84–91.

A pathological condition, the main symptom of which is oedema, occurs in British Guiana. Whether this should be classified as beriberi or epidemic dropsy is still doubtful. The former seems to be the more probable diagnosis.

In 1927 GRACE investigated cases of oedema and nephritis in the Colony. Out of 71 post mortems on such cases carried out by the author in that year, 31 showed only a condition of cardiac failure with dropsy and no gross primary organic lesions in the heart, lungs, liver or kidneys. It was only towards the end of this series that a diagnosis of wet beriberi was made. Pathologically there was evidence of degeneration in the peripheral nerves and supra-renal glands, together with generalized oedema and distension of the heart, especially of the right auricle and the veins opening into it. Those chiefly affected are East Indians living in rural districts and existing almost entirely on white or parboiled brown rice. Many recover with dietary improvement but are liable to relapse after leaving hospital. *A. D. B.*

CRUZ (J. da Costa) & VIANNA (Ary). Sobre o emprego de revulsivos no beri-beri. (Nota prévia.) [**Counter-irritants in Beriberi.**]—*Brasil-Medico.* 1933. Feb. 18. Vol. 47. No. 7. pp. 113–114.

Dr. Carlos CHAGAS, with the notion of testing for the presence of some infective or toxic element acting on the peripheral nerve endings in beriberi, suggested the applicaton of a blister to the limbs with a view to obtaining fluid for inoculation and culture. The results of the latter were negative but to the surprise of Dr. CHAGAS and the authors there was an almost immediate benefit.

Notes are given of ten patients, of whom the following are examples. The patients came to hospital with swelling of the legs, numbness, oedema, inability to walk and shortness of breath. A blister [mosca de Milão, ? cantharides] was applied to each leg, and as soon as fluid appeared, usually in 24 hours, the numbness and weakness disappeared, the odema was much reduced and the dyspnoea was no longer troublesome. In some who had lost the reflexes, these did not immediately return, but the improvement in the other symptoms remained. This is attributed to " raising of the nervous tone " [whatever this may mean], and the explanation vouchsafed is that in beriberi there is not

as a rule serious degeneration of the nerves but merely functional disturbance which is relieved by revulsives. The results were certainly very striking. *H. H. S.*

AALSMEER (W. C.). Ueber den Einfluss der Lugollösung auf den Adrenalineffekt bei Basedow und Beriberi. [**Influence of Lugol's Solution on the Adrenalin Effect in Beriberi.**]—*Klin. Woch.* 1932. Dec. 17. Vol. 11. No. 51. pp. 2111–2113.

It is probable that thyroid dysfunction is present in beriberi. The administration of Lugol's iodine solution gives good results in the treatment of the disease.

The favourable action of Lugol's iodine solution in cases of Basedow's disease can be demonstrated by the disappearance of the so-called adrenalin effect, *i.e.*, falling of minimal blood pressure after subcutaneous injection of 0·5 mgm. adrenalin. A similar satisfactory result after the administration of Lugol's solution was obtained in 3 cases of beriberi. Thus it seems probable that in beriberi a thyroid dysfunction exists and that the disease may be regarded as a pluriglandular syndrome produced by B-avitaminosis. It is claimed that beriberi therapy has been enriched by the use of iodine and that this remedy has been successful even when a vitamin-rich diet had failed to bring about a complete cure. *A. D. B.*

AALSMEER (W. C.). De cardiazol-adrenaline proef bij beri-beri. Het pseudoshoshin. [**The Cardiazol-Adrenalin Test in Beriberi. The "Pseudoshoshin" Condition.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Mar. 14. Vol. 73. No. 6. pp. 374–384.

There have been previous references in this *Bulletin* (Vol. 28, p. 460 and Vol. 29, pp. 92, 614) to the cardio-vascular symptoms in beriberi and to the effect of adrenalin on the minimal blood pressure as a test for the continued activity of the disease. The author has now found that the adrenalin test may fail although the disease is not active, owing to a left heart decompensation along with right-sided insufficiency. Such a result would be apt to lead to a diagnosis of the grave "shoshin" condition, which develops with progressively active beriberi. A slight modification of the test, however, elicits the effect once more. The administration of cardiazol shortly before the adrenalin acts as stimulant to the left heart and brings about the fall in the minimal blood pressure, which is the essence of the test. Controls were instituted to show that the result was not obtained in cases which were not beriberi. The author considers it necessary to differentiate from the "shoshin" condition one which he names "pseudo-shoshin": in this condition a chronic relapsing slight beriberi (slight avitaminosis) and muscular overstrain lead to a decompensation with very similar symptoms. The prognosis of pseudo-shoshin is, however, considerably better than that of shoshin. *W. F. Harvey.*

BURNETT (W. A.). **Report on Investigations into the Problem of Oedema.**—*Sierra Leone Ann. Rep. Med. & San. Dept. for Year 1931.* Appendix H. pp. 81–118. With 2 plates. [33 refs.]

Outbreaks of oedema occurring in Sierra Leone are more allied to epidemic dropsy than to beriberi. The disease is due to histamine-like toxins formed in rice during storage.

The author summarizes his views as follows :—

" Oedema at the Freetown Prison, Wilberforce Barracks, and Kissy Asylum is not that of beriberi (avitaminosis) but . . . is akin to epidemic dropsy. It is not associated with any lack of or diminution of accessory food substances, as vitamin "B," which has been supplied in copious amounts to the inmates of these institutions, nor is it allied with protein starvation. The disease is essentially one of auto-intoxication, due to absorption of highly poisonous nitrogenous putrefactive products, engendered in old rice by the activity of organisms acting in hot and moist conditions and producing bodies of a nature allied to the histamine-tyramine groups. The toxic substances are water soluble, especially in hot water, and they are capable of withstanding boiling water, without considerable alteration of their poisonous principles. This last observation is important, as recommendations have been made in former epidemics that the rice water should be saved and added to the soup.

" The disease-producing grain has a musty odour and, generally with discolouration, displays the presence of decomposition and of fungoid activity. Consumption of such foodstuff is fraught with great danger, resulting, *inter alia,* in the rapid onset of oedema of an extremely fatal nature.

" Rice forms the staple food of the Colony and owing to a rapid extension of swamp-rice farming during the past three years an export trade in it is anticipated. Oedema, therefore, becomes a matter of serious concern, especially where it is known that apart from its incapacitating effects this condition is attended by a very high mortality among consumers of rice which has been permitted to become decomposed." *A. D. B.*

CALCUTTA MEDICAL JOURNAL. 1933. Jan. Vol. 27. No. 7. pp. 195–228.—**Discussion on the Etiology and Clinical Aspects of Epidemic Dropsy.**

——. pp. 229–269. With 22 figs. (5 coloured).—**Discussion on the Pathological Aspects of Epidemic Dropsy.**

An account of a series of meetings held in September 1932 at the Calcutta Medical Club, upon the subject of epidemic dropsy in its clinical, pathological and epidemiological aspects.

Section 1. *Etiology and clinical aspects.*

Dr. NANDI opened the discussion. Epidemic dropsy is entirely distinct from wet beriberi. In epidemic dropsy the absence of peripheral neuritis ; the presence of fever, gastro-intestinal troubles, diarrhoea and the mottling of the skin ; the absence of the disease in sucklings ; the presence of glaucoma, piles, haemorrhages from mucous surfaces and acute pulmonary oedema are distinguishing features. Something in the diet, whether micro-organisms, adulteration or lack of essential factors, is responsible for the disease. Bengalese are commonly affected but Europeans and Marwaris escape. The mustard oil theory of causation is no longer tenable. It seems probable that changes occurring in rice due to storage are responsible for the disease. Treatment is empirical. Bread, meat and fresh fruit are useful preventives. Vegetarians should take dal, chapati, home-made bread and milk, and ghee. The Indian habit of eating ginger and soaked gram in the early morning is to be encouraged.

In the long discussion that followed only some of the remarks can be briefly recorded.

Dr. GHOSH suggested that the toxin responsible for the disease might be a histamine-like substance produced by the action of a fungus on rice. Certain cases derived benefit from *Bact. coli* vaccine. The hydrogenated vegetable oil " Vanaspati " is not the cause of the disease. Dr. DUTT. Marwaris are not affected because they use flour made by themselves. The disease is not communicated from man to man; women are most often attacked because in Hindu families they are apt to be insufficiently fed; cases in children have been recorded. Dr. BHADURI gave a detailed account of glaucoma in epidemic dropsy. The chief clinical features of this condition are (1) high tonometric reading. (2) Normal or deep anterior chamber, as opposed to the shallow one seen in other varieties of primary glaucoma. (3) Early appearance of halos round light. (4) Absence of inflammatory onset. (5) Frequency of haemorrhage after decompression of the globe. (6) Satisfactory results from trephining in a large majority of the cases.

Section 2. Pathological aspect of epidemic dropsy.

Dr. DE opened the discussion and dealt with the autopsy findings in four cases. The following are among the important points :—(1) The abdomen on being opened presented an appearance like a " sheet of blood " and the appendices epiploicae were hard and of a purplish red colour. (2) Subcutaneous tissues showed extensive vascular dilation in the subcutaneous fat. These areas are not " haemorrhagic " but " haemorrhagic-looking." Histologically, enormously dilated capillaries were found in the deep layers of the skin just where the adipose tissue begins. This is the characteristic change in epidemic dropsy. (3) The breasts in a female case showed enlargement, with hard nodules of haemorrhagic appearance. (4) In the heart, separation of the muscular fibres by dilated capillaries is the important feature. There is no degeneration of the cardiac muscle. (5) The bronchi show similar capillary dilatation. (6) Glaucoma is not to be explained by a disturbance at the sclero-corneal junction. Capillary dilatation of the ciliary body is present and may cause excessive production of fluid in the anterior chamber. There is also an angiomatous change in the subchoroidal connective tissue. (7) Marked capillary dilatation is found in the uterus and ovaries. (8) The nervous system does not show much change. There is a moderate vascular dilatation in the spinal cord but considerable in the connective tissue of the peripheral nerves.

In reply to various questions Dr. DE described the changes in the alimentary tract. There is nothing abnormal in the tongue, oesophagus, stomach or small intestines, but the large intestine shows enormous dilatation of the vessels. In one case the suprarenal glands were infiltrated with leucocytes. *A. D. B.*

ACTON (H. W.). The Classification and Grading of Different Qualities of Indian Rices in Connection with the Epidemic Dropsy Problem.—*Indian Med. Gaz.* 1932. Nov. Vol. 67. No. 11. pp. 640–641.

CUBONI (E.). Attività antiberiberica di estratti vegetali contenenti taluni enzimi (fosfatasi).—*Boll. Istituto Sieroterap. Milanese.* 1933. Apr. Vol. 12. No. 4. pp. 253–270. With 2 graphs & 2 plates. German summary (6 lines).

PELLAGRA.

NAUCK (E. G.). Beitrag zur Pathologie und Epidemiologie der Pellagra (nach Beobachtungen aus Transkaukasien). [**Pathology and Epidemiology of Pellagra in Transcaucasia.**]—*Beihefte z. Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Vol. 37. No. 2. pp. 85–124 (5–44). With 15 figs. [8 pages of refs.]

An epidemiological, clinical and pathological study of Pellagra in Transcaucasia.

The first case of pellagra in Transcaucasia was described in 1888. Following this isolated cases occurred until 1929 when a very severe epidemic broke out in West Georgia. Out of a population of about 1,300,000 in this district there were 30–50 thousand cases in 1929. The maximum incidence was in the age period 20–45 years and the ratio of women : men was 3 : 1. Similar figures regarding age and sex incidence were recorded in 1931.

The diet of West Georgia since 1929, as compared with that of neighbouring republics where pellagra is relatively infrequent, had maize as its staple article, while meat and vegetables were rarely eaten. In addition, the years 1927–1929 experienced unusually bad harvests and thus general nutrition was lowered still further and animal food became even more scarce. For example, 40·9 per cent. of the population had meat less than once a month, 25·9 per cent. once a month, 31·3 per cent. 2–4 times a month, and only 1·9 per cent. more than five times a month. In East Georgia, where wheat bread is the staple diet, pellagra is rare. From these observations it is clear that the disease is due to diet deficiency, but whether this is in respect of vitamins or protein cannot yet be determined. A constitutional factor must also be present to account for the comparative rarity of the disease in several members of the same family all living under exactly similar conditions.

The clinical findings in West Georgia do not differ from those in other parts of the world. Mention may be made, however, of associated endocrine disturbances, more especially of the pituitary gland, which is apparently responsible for a diabetes insipidus syndrome (ROSSULEW states that in Middle Asia 25 per cent. of pellagrins show this syndrome). The endocrine system, too, presents important pathological appearances. The suprarenal glands show atrophy, capillary haemorrhages, cellular infiltration, pigmentation, fatty degeneration and even necrosis. In the thyroid is found an increase in interstitial connective tissue and a round-celled infiltration. It is doubtful whether these changes are primary or secondary and the same may be said of many of the pathological findings in other systems. *A. D. Bigland.*

STIEBELING (Hazel K.) & MUNSELL (Hazel E.). **Food Supply and Pellagra Incidence in 73 South Carolina Farm Families.**—*U.S. Dept. of Agric. Wash. Technical Bull. No. 333.* 1932. Oct. 36 pp. [23 refs.]

Satisfactory results in pellagra prevention in a farming community were obtained by supplying definite amounts of food substances of known P.P. value.

The food supply of 73 farm families in Lee County, South Carolina, was studied in connexion with pellagra incidence. Breadstuffs, sweets and fats were the main constituents of the diet in families

affected with the disease in the late spring. This diet was deficient in protein, calcium, iron, vitamins A and C, and P.P. factor. Families not affected had a more abundant diet.

Definite quantities of pellagra-preventing foods were given to 44 families whose condition rendered them liable to disease in the late spring. Results showed that "the addition of 2 to 4 ounces of dry skim milk or 1 pound of evaporated milk, or 1 to 2 ounces of wheat germ, or 1½ pints of canned tomatoes, or one-half pound of cured lean pork, or 1 ounce of pure dry yeast per person per day to the food supply customarily used in winter and early spring suffices to reduce greatly the incidence of pellagra among families which in time of stress subsist on a very monotonous and one-sided diet containing very little milk, lean meat, fish or eggs." *A. D. B.*

WHEELER (G. A.). **The Pellagra-Preventive Value of Autoclaved Dried Yeast, Canned Flaked Haddock, and Canned Green Peas.**—*Public Health Rep.* 1933. Jan. 20. Vol. 48. No. 3. pp. 67–77. [11 refs.]

Dried autoclaved baker's yeast is a good source of P.P. factor; canned flaked haddock is relatively poor in this respect; while canned green peas provide a useful supply of the factor, especially in spring when other supplements are scarce.

The investigations were carried out upon human subjects in the Milledgeville State Hospital. "The substances under test were used as supplements to a basic diet designed to meet all known physiological requirements with the exception that it is deficient in the pellagra-preventive vitamin. When used alone this basic diet leads to the production of pellagra within from three to six months." Sixteen coloured females in the canned haddock test within a period of 2½–6 months showed among other symptoms to a greater or less degree, stomatitis, erosions round the mouth, seborrhoea about the nose, conjunctivitis or ophthalmia and in 2 cases unsteady gait. These "more chronic larval manifestations" of pellagra are compared with similar findings in GOLDBERGER and TANNER's casein diet experiments and in STANNUS' pellagra cases in Zomba Central Prison, Nyasaland. It is possible that such symptoms result from a "sub-marginal" or borderline supply of P.P. factor. When a large supply of canned haddock is given pellagra is entirely prevented. *A. D. B.*

THANNHAUSER (S. J.). Pellagra und endokrine Störungen. [**Pellagra and Endocrine Disturbances.**]—*Muench. Med. Woch.* 1933. Feb. 24. Vol. 80. No. 8. pp. 291–296. With 6 figs. & 1 coloured plate.

ASCHOFF (L.). Pathologisch-anatomische Bemerkungen zu dem vorausgehenden Aufsatz.—*Ibid.* p. 296.

An account of endocrine disturbances occurring in cases of pellagra.

Thannhauser describes a new set of symptoms occurring in pellagra. He gives the name of "Freiburger Symptomenkomplex" to this condition since the cases were observed by him in the University Clinic of Freiburg, in Germany. Three patients are described in detail, both as regards their previous history and clinical findings. There seems to be no doubt that they were suffering from true pellagra. In addition they all presented the following symptom complex:—(1) Generalized chloasma-like pigmentation of a dirty brown colour. (2) Pronounced general hirsutism of a lanugo type. (3) Asthenia. (4)

Calcium deficiency in bones, with a tendency to spontaneous fracture and osteophytic outgrowths on the phalanges and metacarpals. It seems that this symptom complex developed secondarily to the pellagra which had existed for some time previously, but the question of the possibility of a primary suprarenal or pituitary disturbance with secondary pellagra owing to anorexia is discussed. One of the patients died as a result of suicide and an autopsy was performed by Dr. Aschoff. In the endocrine system the pituitary gland was found to be small and there was a " cystotoxic " atrophy of the suprarenal cortex. Two of the patients received treatment with yeast and pituitary extracts. Apparently the pellagra symptoms were relieved but not the endocrine disturbance.

Aschoff commenting upon the foregoing, describes 5 cases of his own observed during the war at Bucharest. The endocrine changes found were (1) diminution in the size of the pituitary gland and considerable decrease in the basophil cells. (2) Atrophy of suprarenal cortex and disappearance of lipoid substances. It is difficult to say whether these suprarenal changes are toxic or the result of premature ageing. It may be asked whether the pigmentation in pellagra is associated with suprarenal disease. Histological preparations show, in contradistinction to Addison's disease, no increase in melanin and therefore it seems probable that the answer to the above question is in the negative. Nevertheless, it is urged that changes in the endocrine system in pellagra are worthy of further study. *A. D. B.*

TURNER (Roy H.). With the Technical Assistance of Ercelle SHELTON. **Erythrocytes in Pellagra.**—*Amer. Jl. Med. Sci.* 1933. Mar. Vol. 185. No. 3. pp. 381–391. With 3 figs. [11 refs.]

An account of the number, size and haemoglobin content of the red blood cells in pellagra.

Blood samples were taken from 50 pellagrins—39 coloured females, 7 white females and 4 white males. 21 medical students were used as controls. Of the pellagrins 56 per cent. showed no anaemia ; 16 per cent. slight or questionable anaemia ; 12 per cent. moderate anaemia ; 4 per cent. extremely severe anaemia. Of 15 fatal cases, 10 showed no anaemia, 2 moderate and 3 severe anaemia. It may be mentioned that 5 of the 8 severe anaemia cases had other conditions which might have contributed to that state. The size of the erythrocytes was, with one exception, normal or less than normal ; that is, the anaemia when present was never of the macrocytic type. 66 per cent. of the patients had a corpuscular haemoglobin concentration within normal limits and 34 per cent. were below normal. Of 24 patients with a varying degree of anaemia 10 had a normal haemoglobin content in the corpuscles and 14 below normal. The patients who suffered from diarrhoea did not appear to be more anaemic than others and the influence of dehydration in obscuring anaemia is discussed. The importance of the blood picture in pellagra, as distinguishing this disease from pernicious anaemia or sprue, is emphasized. *A. D. B.*

FLINKER (Robert). Das Blutbild bei Pellagra. [**The Blood Picture in Pellagra.**]—*Folia Haematologica.* 1933. Vol. 49. No. 1/2. pp. 148–155.

The author examined the blood of 20 pellagra patients at Czernowitz, Rumania, in the summer of 1932. He tabulates the results, separating

the early cases from those of long standing. His findings are briefly these :—The leukocytes were just above normal without change in the Arneth index. The monocyte count was low. Eosinophilia was unusual. In cases of long duration there was considerable lymphocytosis. The count and appearance of the red cells were normal ; the sedimentation rate was increased. *A. G. B.*

SHERMAN (H. C.) & DERBIGNY (I. A.). **Studies on Vitamin G (B_2) with Special Reference to Protein Intake.**—*Jl. Biol. Chem.* 1932. Dec. Vol. 99. No. 1. pp. 165–171.

The finding that animals on a low protein diet are more affected by vitamin B_2 shortage than those more liberally fed suggests that there is more than one nutritional factor in the etiology of pellagra.

The authors summarize their work as follows :—

" Experimental animals which receive diets of liberal protein content (12 or 18 per cent.) were less severely affected by shortage of vitamin G (B2) than were the strictly comparable animals which received protein of the same kind at a much lower level (6 per cent. of the diet), even though the protein was of excellent nutritive value.

" In so far as the symptoms of shortage of vitamin G are regarded as pellagra-like, such vitamin theory of the disease should not preclude recognition of the possibility that the protein supply may also have a significant bearing upon the pellagra problem.

" And in so far as the pellagra problem is to be regarded as nutritional, one should think not in terms of a choice between ' protein theory ' and ' vitamin theory,' but rather of a theory broad enough to take account of the possible participation of more than one nutritional factor." *A. D. B.*

RAMSDELL (Robert L.) & MAGNESS (William H.). **Parenteral Liver Extract Therapy in the Treatment of Pellagra. A Preliminary Report.**—*Amer. Jl. Med. Sci.* 1933. Apr. Vol. 185. No. 4. pp. 568–573. [10 refs.]

Cases of pellagra treated with intramuscular injections of liver extract show marked improvement.

The authors summarize their work as follows :—

" 1. Twenty-two unselected cases of pellagra were treated with liver extract intramuscularly without a death and with rapid marked clinical improvement. We believe that severe cases in either young or old people, which often prove fatal in a short time, can be treated successfully with liver extract.

" 2. In patients with severe mental depression or marked gastrointestinal disturbances who refuse to eat, this method of treatment will give quicker results than dietary treatment.

" 3. It is simple and much easier to carry out than dietary treatment.

" 4. A combination of liver extract and the usual dietary treatment will probably give better results than either alone.

" 5. The time of hospitalization is greatly reduced." *A. D. B.*

SPIES (T. D.). **Intravenous Administration of Wheat Germ to Patients with Pellagra.**—*Proc. Soc. Experim. Biol. & Med.* 1933. Apr. Vol. 30. No. 7. pp. 850–851.

GOLDBERGER and others have shown that wheat germ possesses curative properties when given orally to pellagrins. Many such patients are unable to ingest nutritious food or to retain it after ingestion. A trial of parenteral administration was therefore made, a 10

per cent. solution of wheat germ in normal saline being given first to animals and non-pellagrous patients and then to pellagrins. After 6 pellagrins on a restricted diet had shown benefit from the injections, 4 with severe vomiting who were denied food received them. The stomatitis improved and food was desired, so the experiments ceased. All the patients recovered. No claims are made for the efficacy of this treatment and it is recognized that other factors may have accounted for the improvement. *A. G. B.*

SPIES (Tom Douglas). **Pellagra : Improvement while taking So-called "Pellagra-producing" Diet.**—*Amer. Jl. Med. Sci.* 1932. Dec. Vol. 184. No. 6. pp. 837–845. With 2 figs.

Five cases are described in which the skin manifestations of pellagra improved strikingly upon a diet believed to be lower in protein and vitamins C, D and G than so-called pellagra-producing diets. The possible presence of a secondary factor in the causation of the disease, analogous to the gastric defect in pernicious anaemia, is suggested.

The patients in this experiment consisted of 4 white males and 2 negresses. All had typical pellagra. "Each patient received a daily diet of 2,300 calories (carbohydrate 1,700 ; protein 110 ; fat 490) consisting of cornmeal mush, cornmeal muffins, pork fat, maple syrup, polished rice, cornstarch pudding, coffee and sugar." This diet is more restricted than that causing pellagra in GOLDBERGER'S original experiment. In case 1 all signs and symptoms disappeared during the first 2 weeks. In case 2 by the end of the 5th week the skin was smooth and shiny and mucous membranes of mouth and vagina had become normal. She remained 8 weeks on the diet. Case 3 continued 37 days on the diet and during the second week the dermatitis and mucous membrane lesions disappeared. Case 4 showed rapid improvement in skin lesions. The total period of diet was 20 days. Case 4 showed rapid improvement in skin lesions. The total period of diet was 20 days. Case 5 after 2 weeks improvement suddenly relapsed and was eventually cured by feeding through a duodenal tube with a diet rich in vitamins and proteins. In case 6 within 12 days the skin was normal but the sore tongue progressed. At the end of 3 weeks a high caloric diet was substituted and the tongue rapidly returned to normal. *A. D. B.*

BARRADA (Yousif). Clinical Aspects of Pellagra.—*Jl. Egyptian Med. Assoc.* 1932. Sept. Vol. 15. No. 9. pp. 609–618. With 2 figs. [11 refs.]

FAKHRY (Asaad). Treatment of Pellagra.—*Jl. Egyptian Med. Assoc.* 1932. Sept. Vol. 15. No. 9. pp. 619–624.

MASSA (Mario). Sensibilizzazione alla luce e porfirine nei riguardi di affezioni etiopatogeneticamente oscuri (pellagra, delirio acuto). Nota preliminare. —*Riforma Med.* 1932. Oct. 29. Vol. 48. No. 44. pp. 1669–70, 1673. [15 refs.]

SABRY (Ibrahim). Ueber die chemische Natur des "Pellagratoxins" und die Entdeckung der Thiosulfatbehandlung der Pellagra.—*Dermat. Woch.* 1933. Feb. 18 & 25. Vol. 96. Nos. 7 & 8. pp. 217–226 ; 265–274. With 4 figs.

WHITE (E. Barton) & TAYLOR (A. L.). A Case of Pellagra.—*Jl. Mental Sci.* 1932. Oct. Vol. 78. No. 323. pp. 929–934.

LEPROSY.

British Empire Leprosy Relief Association. **Leprosy: an Economic Problem. Being the Annual Report for 1932 of the British Empire Leprosy Relief Association.**—32 pp. With 7 figs. London: 29 Dorset Square, N.W.1.

In this annual report the economic loss due to leprosy is stressed and illustrated by Dr. Rose's investigations in British Guiana, where the modern methods of prophylaxis by the effective treatment of early cases at clinics, in place of the expensive and ineffective compulsory segregation, has been introduced at a cost of about £10,000 a year. To this must be added the loss of the services of the lepers, whose lesions might have cleared up if discovered and treated early. The expenditure of the Association on supplying drugs for treatment in our overseas possessions is still increasing, and three-quarters of a million doses were supplied in 1932, and grants for additional accommodation for treating lepers were made to six colonies. An appeal of Lady Denham for a home for leper children in British Guiana is included in the report.

L. Rogers.

Leprosy Review. 1933. Apr. Vol. 4. No. 2. pp. 46–89. With 9 figs. on 4 plates & 1 sketch map. Quarterly Publication of the British Empire Leprosy Relief Association, 29 Dorset Square, London, N.W.1.

Interesting information on the leprosy problem in several countries is recorded in this number. In Ceylon the report of the superintendent of the Hendala Asylum shows the high incidence of 6·2 per mille in the Eastern province of the island, and it is stated that compulsory segregation has not reduced leprosy in Ceylon; its modification for application only to infective lepers is advocated, with clinics for outdoor treatment of early cases. As 15 per cent. of the cases are Indian immigrants they should be repatriated. He concludes that: "A suitable centre should be selected to carry out prophylactic measures along the lines suggested, thereby to demonstrate the period within which leprosy could be stamped out."

Leprosy in the Gutu Province of Southern Rhodesia is dealt with by B. Moiser, who estimates the cases at 80 or 1·6 per mille.

Anti-leprosy movements in Japan were discussed by A. Oltmans at the 1932 Shanghai Leprosy Conference. There are indications of the existence of the disease there as early as the fourth century A.D. Under the law for the Prevention of Leprosy of 1907 regional leprosaria are being erected and there are also some earlier founded institutions under the Mission to Lepers. The lepers are estimated at forty to sixty thousand, or 1 per mille population. The Government is opposed to outside clinic work for leprosy patients, although there are thousands who might be treated at comparatively small expense in out-patient clinics. Recent official figures show 14,261 registered lepers of whom 3,638 are in six government hospitals, and 682 in private ones, leaving about 10,000 untreated, while for each registered hospital case there are believed to be ten outside untreated. Still, progress is being made at a heavy cost of approximately £20 per annum per case treated in a leper hospital, not including the cost of the new buildings. The authorities do not favour paroling arrested cases for fear of relapse

and owing to society not wanting to take them back. The proper care of child lepers is said to be largely neglected and only 27 are found in all the government hospitals. There are still many difficulties ahead.

L. R.

LEPROSY IN INDIA. 1933. Jan. Vol. 5. No. 1. pp. 1–53. With 6 figs. Issued quarterly by the Indian Council of the British Empire Leprosy Relief Association.

The following are the more interesting articles in this issue. R. H. GOHEEN reports on two leper women with trophic ulcers in whom he resected the lumbar sympathetic ganglia by a laparotomy incision with a view to removing the vaso-constriction and permitting larger blood supplies to the tissues. Temporary improvement followed, but the final results were disappointing as the ulcers reappeared at the original sites.

Dr. LOWE reports on the re-examination of 84 discharged Dichpali leprosy cases after ½ to 4 years with an average of 14 months. The percentage showing relapse was 14, but only a fraction of the total discharged cases returned. Of 42 cases bacteriologically negative on discharge only 2 relapsed, and of 42 clinically inactive, but showing a few bacilli still present, 10 relapsed. Most of the patients before discharge had shown no reaction to potassium iodide up to 240 grain doses, but 11 of the 12 relapsing cases had been submitted to this test, which is thus not a reliable one of cure. The 84 cases had been under treatment for from ½ to 9 years with an average of 2 years 8 months.

E. MUIR and S. P. CHATTERJI report favourably on the value of 3 cc. gradually increased to 10 cc. doses of mercurochrome intravenously in leprosy cases complicated by septic conditions, lepra reaction or liquefaction and breaking down of lepromata. In the Himalayan state of Bhutan leprosy is very common on account of great overcrowding with one or more families sleeping in the same room, according to Dr. J. A. MACDONALD.

Dr. J. LOWE emphasizes once more the importance of the clinical recognition of the very early bacteria-negative lesions of leprosy, and he criticizes the description in an article in a British textbook of medicine written by a specialist in which a lepra reaction is described as the commencement of the disease.

E. MUIR reports further on the technique of the now generally used intradermal method of treatment. He also criticizes the views of MOLESWORTH on racial immunity.

The report of the Mission to Lepers to August 1932 records that at the end of the previous year 6,225 lepers were resident in the Mission's 37 Indian Homes, 760 healthy children of lepers were being cared for, and 4,418 out-patients were attending their dispensaries for treatment; the latter being a comparatively recent and valuable development of their work. The expenditure was Rs.7,94,017 (approximately £60,000). Further, in 450 cases the disease had become arrested without deformity and in 337 more with deformity. *L. R.*

LEPROSY IN INDIA. 1933. Apr. Vol. 5. No. 2. pp. 55–111. With 6 figs. (1 map). Issued quarterly by the Indian Council of the British Empire Leprosy Relief Association.

This issue deals among other things with the following subjects:—The treatment of trophic ulcers based on thirteen communications

which summarize our information. The leprosy clinic and the control of leprosy by J. LOWE, in which the need of more preventive work of clinics is emphasized, in the form of instructing the people in avoiding contagion. Leprosy of the lungs is dealt with by E. MUIR with records of ten cases. The diagnosis is confirmed if the sputum and acid-fast organisms diminish rapidly as the lepra reaction passes off. The discovery of lepra organisms in thick blood films was found by E. B. CHRISTIAN to necessitate much searching even in advanced skin cases. in contrast to large number of bacilli found in the first field of the microscope by examination of the skin lesions in most cases.

A number of surveys and other work, mainly of local interest, are reported, with the usual result of finding many early unsuspected cases and the starting of dispensary treatment under the local authorities with the aid of local committees. For example, in the Orissa Mayurbhanja State only 78 lepers were known to the police, but after a survey 400 patients were enrolled at the clinic in the same area, in addition to 200 from beyond it. In the Kulu hill area of the Punjab a survey detected 266 cases, or the high rate of 3·36 per mille, with infection in 25 per cent. of the villages. In an area of Lower Burma 121 lepers were found among 20,480 people, or thirteen times the number previously known. *L. R.*

BRITISH EMPIRE LEPROSY RELIEF ASSOCIATION. **Annual Report of Indian Council for 1932.**—81 pp. With 19 figs.

The annual income is derived from an endowment fund which brings in £9,000 a year to cover the research work in the Calcutta School of Tropical Medicine, provincial leprosy surveys and grants to the provincial governments. A remarkable increase in the number of leprosy clinics and of the patients treated in them is shown. Thus in the large Salem district of Madras the patients attending the clinics increased from 3,776 to 10,000, and a sum of £2,000 was collected by a leper day propaganda. The total in those provinces for which the figures are recorded reach 108,000, exclusive of Madras with over 300,000 attendances (number of patients not given) so the total leper patients for all India must now be about 150,000, or half as many again as were recorded for all India in 1921, owing to the number of unrecorded early cases that have been attracted to the clinics to obtain the modern treatment. The survey party has now been dissolved after several years' valuable work. In Calcutta 59 doctors were instructed in treatment in addition to some taught at Dichpali in Western India.

L. R.

MUIR (E.) & LOWE (J.). **Leprosy Relief in India. A Review of the Present Situation, and a Suggested Policy for Provincial and Local Authorities.**—*Indian Med. Gaz.* 1933. Feb. Vol. 68. No. 2. pp. 88–92.

This paper is on the same lines as that of Dr. Lowe on Leprosy in India, Vol. 5, No. 2, noted above. It brings out well the importance of preventive as well as treatment work by leprosy clinics. The staff visit the homes of the patients and give instruction in the measures necessary to prevent new infections arising through contact with the patients, *e.g.*, by their sleeping in the same room as healthy persons especially susceptible children. *L. R.*

GUPTA (A.). **Some Observations on the Diagnosis and General Management of Leprosy.**—*Calcutta Med. Jl.* 1932. Nov. Vol. 27. No. 5. pp. 121–132. With 9 figs. on 4 plates.

The author emphasizes the importance of diagnosing the disease clinically long before nasal smears have become positive bacteriologically and he discusses the differentiation from other common skin affections. He considers that chaulmoogra therapy still occupies the foremost place, and on the whole he is "quite optimistic about the results of the treatment of leprosy," if cases are seen fairly early.

L. R.

DE MARQUEISSAC (H.) & SOHIER (H.). Enquête sur la lèpre en pays Kabré (Nord-Togo). [**Leprosy in the Kabré Country (North Togo).**] —*Bull. Soc. Path. Exot.* 1933. Mar. 8. Vol. 26. No. 3. pp. 474–485. With 2 charts.

This enquiry relates to an area in North-Togo in West Africa, where 653 lepers were found among 109,061 people examined, or 0·59 per cent., but among children under 15 the rate was only 0·16 per cent.; 68 per cent. were skin, 26·3 mixed and only 5 per cent. pure nerve cases. The infant mortality of the children of lepers was only slightly above the average, and 18 per cent. of pregnancies ended in abortion. The people attribute the disease to sorcery, punishment for theft, etc.

L. R.

ROSE (F. G.). **Six Years of Leprosy Work in British Guiana.**—*Brit. Guiana Med. Ann. for 1932.* pp. 35–44.

This paper records the remarkable progress that has been made in the last few years in the campaign against leprosy in British Guiana since the modern hospital and dispensary treatment has replaced the old rigid compulsory segregation, with inevitable hiding of the early more amenable cases, as will appear from the summary of the author below. In referring to the opinions of two London writers on leprosy Dr. Rose remarks :—" It would be unfair to the millions of persons suffering from leprosy throughout the world to allow so pessimistic a pronouncement to go unchallenged."

" 1. Extended trial of certain drugs in the treatment of leprosy in British Guiana has demonstrated the superiority of hydnocarpus oil and its products.

" 2. The standard method of treatment is now Alepol intravenously followed by hydnocarpus oil or esters together with such supplementary aids as trichloracetic acid, carbonic 'snow,' electrical treatment, surgery, etc.

" 3. The weight chart is used as the guide to dosage.

" 4. Of 194 early cases treated during the past six years, 168 or 86·6 per cent. have improved, and out of 63 of those who were open cases, 69·8 per cent. have become closed after treatment.

" 5. Of 297 advanced cases, 65 per cent. have improved, 64 have become arrested, and 59 quiescent.

Of 192 advanced cases originally open 31·8 per cent. have become closed after treatment.

" 6. The proportion of relapses has been 4·7 per cent.

" 7. The notification figures reveal a tendency to a decrease in the incidence of leprosy in British Guiana.

" 8. Nearly all the cases now being discharged leave without any of the stigmata of leprosy.

" 9. In spite of the large number of cases now being treated, and the additional measures instituted, the cost of upkeep of the Leprosy Hospital has decreased from $41,626·85 in 1926 to $31,136·09 in 1931." *L. R.*

LAMPE (P. H. J.). Heeft lepra neiging tot spontane stilstand in haar ontwikkeling zonder blijvend defect? [**Has Leprosy a Tendency to Spontaneous Arrest?**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1932. July 19. Vol. 72. No. 15. pp. 946–952. With 1 fig. [14 refs.] English summary (7 lines).

Surinam holds a very favourable position for the study of the epidemiology of leprosy with its small population (150,000), its good medical supervision and its satisfactory methods of registration. In this article the age distribution of leprosy according to race and morbidity-index are set out. An especially interesting curve and table show the frequency distribution per thousand of lepers living at the different age periods as compared with those of the general population. The figures are: (1) lepers, 17, 125, 185, 183, 205, 130, 88, 52, 15 and (2) general population 129, 107, 107, 101, 152, 151, 109, 94, 45, 5 for the age periods, in years, 0–4, 5–9, 10–14, 15–19, 20–29, 30–39, 40–49, 50–64, 65–79 and 80+. By comparison with the general curve which descends gradually from a high point, we see here the rapid rise of the leprosy curve from zero at birth to a peak at 20 years of age, its rapid fall thereafter to 30 years of age and its parallelism from about this age onwards to the general curve. It is especially the rapid fall of the curve from its peak which requires explanation and the possibilities considered are (*a*) an incorrect diagnosis of leprosy at an early age, (*b*) that the increase of young lepers is a recent phenomenon, (*c*) less complete knowledge of older lepers, (*d*) increased risk of death of the older lepers, and (*e*) inability to recognize lepers as such with advancing age. The answer to these possibilities is given in the author's concluding English summary:—

" A study of the morbidity rates of 'manifest' leprosy . . . leads to the hypothesis that in many cases the early symptoms of leprosy in children and young adults remain stationary or diminish; in other words . . . that only part of the external visible leprosy-infections develop to a more advanced leprosy-suffering which in countries with endemic leprosy is known as such also by laymen." *W. F. Harvey.*

TISSEUIL (J.). Classification biologique des syndromes de la lèpre. [**Biological Classification of Stages of Leprosy.**]—*Bull. Soc. Path. Exot.* 1933. Jan. 11. Vol. 26. No. 1. pp. 10–12.

The author describes a primary period of the first manifestations of leprosy, a secondary with thickened papules and nodules of the skin, a tertiary period with subcutaneous fibrous nodules and ulceration, and a quarternary with sclerosis of the dermal lesions and the appearance of secondary nerve lesions. Marcel LEGER in discussing the paper disagreed with these views. *L. R.*

CONZEMIUS. L'elimination de *Mycobacterium leprae* par desquamation cutanée physiologique. (Note préliminaire.) [**Elimination of *Myco. leprae* by Desquamation of Skin.**]—*Ann. Soc. Belge de Méd. Trop.* 1933. Mar. 31. Vol. 13. No. 1. pp. 1–3.

The author was able to confirm in one case the observation of MUIR and CHATTERJEE that light scrapings of the skin over leprous lesions

not drawing blood may show numerous acid-fast bacilli, which may thus be given off by desquamation in the absence of any ulceration. A. DUBOIS in discussing this note was not satisfied that the bacilli had not been derived from the nasal discharge of the patient infecting the skin, since sections of such lesions showed few or no bacilli in the superficial epithelial layers. *L. R.*

THOMAS. Contribution à l'étude du diagnostic et du traitement de la lèpre chez le noir. [**Diagnosis and Treatment of Leprosy in the African.**]—*Bull. Méd. du Katanga.* 1932. Vol. 9. No. 6. & 1933. Vol. 10. No. 1. pp. 149, 151, 153–5 ; 1, 3–7.

The author records that occasional trials of bismuth, tartar emetic, mercury cyanide and gold salts had not yielded any results, and he goes on to describe the use of various preparations of chaulmoogra oil. These had no influence orally, but produced a light polynuclear increase when injected into the muscle or a vein. Of 41 cases treated only 4 showed clear improvement of the lesions, 3 died, 19 showed a certain amount of general improvement and gain in weight with ups and downs of the lesions, and 15 nerve cases remained stationary or got worse. *L. R.*

SCHWETZ (J.). A propos du traitement de la lèpre par la trypaflavine. [**Treatment of Leprosy by Trypaflavine.**]—*Ann. Soc. Belge de Méd. Trop.* 1933. Mar. 31. Vol. 13. No. 1. pp. 43–47.

Good results have been reported by Marcel LEGER from the use of trypaflavine in leprosy, so the drug was tried in eight nodular and macular cases and one recent case. In none of them had trypaflavine the least influence on the progress of the disease either clinically or bacteriologically. *L. R.*

DUBOIS (A.) & URY (J.). Note sur le traitement de la lèpre pas les sels d'or. [**Treatment of Leprosy by Gold Salts.**]—*Ann. Soc. Belge de Méd. Trop.* 1933. Mar. 31. Vol. 13. No. 1. pp. 5–11.

The authors have tried injections of solganol and solganol B, and in a few cases such other gold preparations as Chrysalbine, Allochrysine and Lopion, in cases of leprosy in the Congo area, using cutaneous cases with numerous lepra bacilli in the lesion as the best test of the specific action claimed for gold preparations. Ten cases were treated, but one died, one could not stand the drugs and in one the treatment was too short. In the other seven injections were persisted with for seven months, but in no case did improvement, either clinical or bacteriological, result and one was worse, although in three of them a total of four to five grams of the drugs were given. They therefore conclude that the treatment was valueless, but think that larger and less frequent doses might be worth trying. *L. R.*

STRACHAN (P. D.). **Chaulmoogra Oil in the Treatment of Leprosy.**—*South African Med. Jl.* 1933. Apr. 8. Vol. 7. No. 7. pp. 210–214.

The author noticed that out of 21 patients discharged with arrested leprosy 9 were classed as spontaneous arrest, including 7 early cases,

and some of the others did not appear to have had adequate treatment. An analysis of the dermal and mixed cases in the Basutoland Leper Asylum showed 13·24 per cent. of arrests among 461 treated, and 3·83 among 265 cases with no treatment or under ten injections, while only 21·43 of C1 treated cases were arrested. Since 1927 alepol, which is best tolerated, and iodized esters have been used with local applications of trichloracetic acid, and in 112 cases with no or trivial treatment the arrests were 52·7 per cent., in those with inadequate treatment (less than 20 injections within six months (41·7 per cent.) and in 101 adequately treated cases 48·5 per cent., but in N1 (slight nerve cases) the figures were 61·5, 78·7 and 79·25 respectively. The majority were advanced cases, and it is suggested that early nerve cases might show different results. The importance of favourable conditions, diet, hygiene, exercise and treatment of concurrent diseases in the treatment of leprosy is emphasized. *L. R.*

LARA (C. B.) & LAGROSA (M.). **Observations bearing on the Question of Whether or Not the Chaulmoogra-Group Drugs have any Special Action in Leprosy : I. Changes in Leprotic Skin Lesions following Intradermal Injections of Various Oily Preparations.**—*Jl. Philippine Islands Med. Assoc.* 1932. Dec. Vol. 12. No. 12. pp. 599–603.

The rôle of local tissue irritation in connexion with the improvement following injections of antileprotic drugs on one side of the body only in cases with symmetrical lesions, leaving the uninjected lesions on the other side as controls has been tested. Ethyl stearate and ethyl oleate were used, as well as iodized wightiana esters, and the two former caused more local irritation than the wightiana one. It was found that after ten months' treatment the less irritating wightiana preparation had produced more improvement than the other more irritating esters ; so the conclusion is come to that " the local inflammatory processes produced by injections of the chaulmoogra preparations are not a necessary, or even an important, factor in the improvement observed with the use of these drugs." *L. R.*

LAGROSA (Manuel). **Changes in the Anesthesia following Antileprotic Injections of Iodized Hydnocarpus Wightiana Ethyl Esters.**—*Jl. Philippine Islands Med. Assoc.* 1932. Dec. Vol. 12. No. 12. pp. 604–608.

The author describes a trial, on similar lines to those of the foregoing note, of intradermal and subcutaneous weekly injections in the purely anaesthetic areas on one side of the body only of iodized wightiana ethyl esters, in addition to routine intramuscular injections, with clinical tests every five weeks and at about six months after the last injection. He concludes that the local treatment of anaethesia in cases with no other dermal lesions has a definite value, as complete and permanent return of normal sensibility may be expected in favourable cases, and that the same principle of bringing the drug into intimate relation with the affected nerves may also prove effective in preventing neurotrophic changes. The intradermal doses appeared to be more effective than the subcutaneous ones, but subcutaneous injections are indicated along the course of an affected nerve trunk. *L. R.*

PALDROCK (A.). Der Sektionsbefund einer mit CO_2-Schnee behandelten Leprösen. [**Autopsy of a Leper treated with CO_2 Snow.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. May. Vol. 37. No. 5. pp. 271–276.

This is an interesting case of dermal leprosy affecting the eyebrows and ears and with two ulcers on the right arm, the lesions of which cleared up clinically and bacteriologically under carbon-dioxide snow, local applications and chaulmoogra oil internally, and later solganol injections. A relapse occurred after five years, when the snow treatment was resumed and alepol given, the latter having no effect, but the local treatment and solganol cleared up the new skin lesions. She died of gangrene of the foot after it had been chafed, and a minute microscopical examination of the tissues and internal organs showed only a few acid-fast bacilli in the epiglottis, so cure is claimed. *L. R.*

BLACK (Kenneth). **Periarterial Sympathectomy for the Ulcerations of Leprosy.**—*Malayan Med. Jl.* 1933. Mar. Vol. 8. No. 1. pp. 60–61.

Section of the sympathetic nerves was carried out in Hunter's canal in 13 lepers, in addition to two cases formerly published, for old standing perforating ulcers of the feet of from eight months to twelve years duration which had failed to respond to rest and antiseptics ; in only one was there bone necrosis. In every case complete healing took place in one to eight weeks, but in six of the thirteen relapses occurred, usually due to the patients' fault. One soon healed again with rest in bed, and in the eight ultimately successful cases the ulcers have remained healed for from four to fifteen months. Complete rest in bed for two weeks after healing is essential to success. *L. R.*

ADANT (M.). Quelques recherches sur la lèpre. [**Researches on Leprosy.**]—*Ann. Soc. Belge de Méd. Trop.* 1932. Dec. 30. Vol. 12. No. 4. pp. 411–427. [30 refs.]

Attempts to cultivate the lepra bacillus in the media of Löwenstein and of Sonnenschein, and modifications of them, were completely negative. Inoculations of Cercopithicus and Cynocephalus monkeys, with and without splenectomy, with lepra bacilli also failed. He has also studied the sero-diagnostic methods of MATEFY, BOTELHO and of RUBINO, and found that the last two gave results of interest, and he considers that Rubino's reaction is the more specific one, since by absorption methods heteroagglutination is avoided. Moreover, Bargehr's cutaneous reaction with leprolin gave negative results in advanced lepers and in their contacts and in children who were free from leprosy. *L. R.*

WATANABE (Yoshimasa) & HARAZAWA (Jinsai). **Pure Cultivation and the Animal Experiments of Acid-Fast Bacilli from the Blood of the Leprous Patients.**—*Kitasato Arch. Experim. Med.* 1933. Apr. Vol. 10. No. 2. pp. 87–98.

These workers made cultures of the blood of lepers by Löwenstein's method, somewhat modified and including Japanese carrot extract, and obtained two kinds of acid-fast bacilli in 8·6 per cent. of their trials, most frequently from the leucocytes and sediment of the blood.

This proportion was much less than they got by cultures of nodules which gave 40 per cent. of positive results. They were unable to infect mice or rats and are doubtful whether their cultures are those of the lepra bacillus. *L. R.*

LÉPINE (P.), MARKIANOS (J.) & PAPAYOANNOU (A.). Sur l'hémoculture du bacille de Hansen par la méthode de Löwenstein. [**Culture of Leprosy Bacillus by Löwenstein's Method.**]—*C. R. Soc. Biol.* 1933. Mar. 10. Vol. 112. No. 9. pp. 845–846.

The authors record only negative results from the use of Löwenstein's method of haemoculture of the lepra bacillus. *L. R.*

MCKINLEY (Earl B.) & VERDER (Elizabeth). **Cultivation of** *Mycobacterium leprae.*—*Proc. Soc. Experim. Biol. & Med.* 1933. Feb. Vol. 30. No. 5. pp. 659–661.

These workers have continued the investigation of SOULE and MCKINLEY [*ante*, p. 238] which had enabled them to carry their non-chromogenic acid-fast bacillus obtained from cases of leprosy through eight and sixteen generations respectively, and to produce suggestive lesions in two monkeys. After eighteen months only two colonies were obtained, and one of these was planted out in embryonic tissue made from minced chick embryo 7 to 11 days old washed and suspended in Tyrode's solution ; this proved more successful than human embryonic tissue, which was also tried. Growth was stimulated and obtained in five days under CO_2 and O tension and under ordinary atmospheric conditions, and they are now able to cultivate the strain on young chick embryo tissue medium apparently indefinitely since it has remained viable for two years. They have also obtained cultures in their new medium direct from nodules from three different cases of leprosy after treating the emulsions with 3 per cent. sodium hydroxide to destroy contaminating organisms, so they believe that cultures of Hansen's bacillus of leprosy can now be readily obtained. *L. R.*

OTSUKA (Hiroshi). **On the Sedimentation Phenomena of Red Blood-Cells and the Amount of Total Nitrogen, Non-Protein Nitrogen, Fibrin Nitrogen and Sugar in the Blood of Lepers.**—*Japanese Jl. Dermat. & Urol.* 1933. Feb. Vol. 33. No. 2. [In Japanese pp. 127–169. With 12 charts. [46 refs.] English summary pp. 15–34. With 10 charts.]

This paper records a good deal of work which is well summarized in the following conclusions of the author.

" 1. I determined the sedimentation velocity and type, total nitrogen, non-protein nitrogen in blood, fibrin nitrogen in plasm, blood sugar in the fasting state in the morning and at noon time, and followed the changes in blood sugar for two hours after the ingestion of glucose or the administration of adrenalin chloride on out-patient lepers of our dermatological department.

" 2. The sedimentation velocity is higher than normal in 51·9 per cent. of the cases examined and it increases in the order of the nervous, maculous mixed and tuberculous types. There is a parallelism between the sedimentation velocity and the grade, condition of the affections and the lepra reaction, and no relation between it and the sex, the age and the duration of disease. In cases in which the condition becomes improved or arrested

by the treatment, the sedimentation velocity is greater than in progressive cases without treatment.

" 3. In 5 per cent. of the lepers examined the sedimentation velocity is much less than normal or the relation between the velocity and the type of sedimentation varies from that of normal, tuberculosis and of urogenital diseases.

" 4. The total nitrogen of blood in leprosy is normal for the nervous type and decreases in order of the maculous, mixed and tuberculous type. There is a relation between the amount of the total nitrogen and the condition of affection and the sedimentation velocity, and it seems that the grade and treatment have no influence upon the total nitrogen.

" 5. The non-protein nitrogen in blood increases in order of the mixed, tuberculous, nervous and maculous type, though it is under 40 mg./dl. except in two cases. It increases in proportion to the grade, the condition and the albumen test in urine, and it has no relation to the sedimentation velocity and the lepra reaction by *Toyama-Miyoshi.*

" 6. The fibrin nitrogen in plasm increases in order of the nervous, maculous, mixed and tuberculous type, and in proportion to the grade, the condition of affection and the sedimentation velocity of the red blood-cells. The value of fibrin nitrogen rises higher with treatment and there is no relation between it and the *Toyama-Miyoshi's* lepra reaction.

" 7. The blood sugar in the fasting state in the morning is less than 120 mg. per cent. without exception and increases 4·5 per cent. in amount from the normal, and there is no change in value for the types.

" 8. The blood sugar in the fasting state at noon time increases as much as 10·5 per cent. in amount from the normal and there are 12 per cent. of cases on which the sugar is more than 120 mg. per cent. The rate of increase diminishes in order of the nervous, maculous, mixed and tuberculous types. It is inversely proportional to the grade and the condition of affection and directly proportional to the sedimentation velocity. The sugar test in urine was negative in all of the subjects examined. There is no relation between the blood sugar and the positive albumen test in urine. The treated lepers have much more blood sugar than the cases without treatment.

" 9. The alimentary glycemia caused by the ingestion of 100 gr. of glucose by the mouth rises not so high as the normal, and the return to the normal value is not markedly disturbed in cases of light affection, in cases in an arrested state or in chronic progressive state and in cases with treatment. In cases of heavy affection and in acute progressive cases without treatment, the rate of increase in blood sugar is greater and it needs more time to reach the maximum value and subsequent return to the normal value is delayed, so that the higher value of blood sugar continues for a longer duration than the normal.

" 10. Though the adrenalin hyperglycemia changes a little from the normal on the whole, there are cases in which the hyperglycemia rises much higher or is remarkably lower than the normal. In cases of heavy affection, in cases of improved or arrested condition and in treated cases, the restrained phenomena of adrenalin hyperglycemia take place more frequently than in other cases." *L. R.*

CHIYUTO (Sulpicio). **Is the Histamine Test Valuable in the Diagnosis of Early Leprotic Macules.**—*Monthly Bull. Philippine Health Serv.* 1932. Nov. Vol. 12. No. 11. pp. 628–632.

Thirty-four histamine tests were made in leprotic nodules of 30 patients, and 14 with tuberculoid changes histologically were all positive, but of 20 lesions showing histologically perivascular infiltrations 3 only were positive and 17 negative, and the former only showed anaesthesia. The test is therefore not dependable in the early stages when only perivascular infiltration is present without neurological changes. *L. R.*

MONTAÑES (P.). Vorläufige Mitteilung ueber eine Intracutanreaktion zur Lepradiagnose. [**An Intracutaneous Reaction for the Diagnosis of Leprosy.**]—*Arch. f. Dermat. u. Syph.* 1933. Mar. 2. Vol. 167. No. 3. pp. 578–584.

The author prepared a leprolin for intracutaneous diagnostic purposes by treating ground up unulcerated lepromata with 10 per cent. caustic potash solution at 37°C., filtering through glasswool and centrifuging to separate the acid-fast bacilli. The sediment of 20 grams of the original leprous material in 200 cc. physiological salt solution, 0·9 per cent., with 0·5 per cent. carbolic acid, was used in 0·2 cc. doses for intracutaneous injections into the healthy skin in front of the elbow. Control injections were made with similar preparations of the grass bacillus, Ducrey's bacillus and extracts of lupus tissue. An unimportant traumatic reaction results in 24 hours and disappears in 2 to 3 days. Later a positive reaction is shown by a small hard infiltration the size of a lentil, appearing in 6 to 8 days, enlarging and lasting for 15 to 30 days and disappearing in 5 to 6 months. In 119 lepers 99 were negative and 17, or 13·91, definitely positive, the rest being doubtful. Only 3·7 per cent. of cases of 0 to 10 years duration were positive, and 4·85 per cent. of bacteriologically positive cases, against 75 per cent. negative to bacilli, and 100 per cent. of definitely progressive forms were negative while the controls were positive. The method appears to be promising, and it is being compared with Bargehr's method. *L. R.*

TISSEUIL (J.). Contribution à l'étude des réactions cutanées dans la lèpre : dissociation des réactions dermique et sous-cutanée dans un cas de lèpre tuberculoide. [**Skin Reactions in Leprosy.**]—*Bull. Soc. Path. Exot.* 1933. Apr. 5. Vol. 26. No. 4. pp. 576–579.

The author has investigated the reactions in two tuberculoid lepers after the injection of sterile emulsions of human lepromata. The injections were made into the intermediate zone and the peripheral border of the lesion, and into the healthy skin. Reactions were provoked after a few hours in both the tuberculoid lesions and in the healthy skin, and in one case an abscess formed 15 days later following an inflammatory condition. Subcutaneous injections at the edge of a nodule formed an abscess in the patient with only two skin leprous lesions, but produced no reaction in the other patient with very extensive tuberculoid lesions. *L. R.*

TISSEUIL (J.). Nouvelle série de traitement de la lèpre du rat. [**Treatment of Rat Leprosy.**]—*Bull. Soc. Path. Exot.* 1933. Apr. 5. Vol. 26. No. 4. pp. 579–584.

In the series now reported the rat-leprosy bacillus containing material was injected subcutaneously, instead of intraperitoneally, so that the slowly developing lesions could be watched. Treatment was commenced after 1 or 2 months when small nodules were appearing in the skin some of which later ulcerated. Among the preparations tried in treatment were extracts of lepromes in acetone or methyl alcohol, the former of which had only a temporary good effect, while the latter accelerated the evolution of the nodules. Chaulmoogra esters with 5 per cent. creosote had a beneficial general effect and retarded the progress of the disease. A chaulmoograte of gold guaiacol, supplied

by Professor DÉLÉPINE, appeared to slow the progress during the first month, but later it was more advanced than in controls. Molybdate of ammonium had a definitely beneficial effect, with less thickening of the lesions and delayed ulceration and more rapid healing and maintenance of the general condition. *L. R.*

MARCHOUX (E.) & CHORINE (V.). Résistance du bacille de la lèpre du rat aux acides et aux alcalis. [**Resistance of the Rat Leprosy Bacillus to Acids and Alkalis.**]—*Bull. Soc. Path. Exot.* 1932. Dec. 14. Vol. 25. No. 10. pp. 1025–1026.

As rat leprosy can readily be produced by inoculation of the material containing it the effects of disinfectants on its vitality can be tested. The experiments here recorded show that the organisms treated with 5 per cent. sulphuric acid or 15 per cent. antiformin did not lose their vitality. *L. R.*

VIALARD, VERLIAC & BERGE. Sur un cas de lèpre mixte à incubation prolongée. [**Case of Mixed Leprosy of Long Incubation.**]—*Bull. et Mém. Soc. Méd. Hôpit de Paris.* 1933. Apr. 3. 49th Year. 3rd Ser. No. 11. pp. 411–414.

A case is described of leprosy in a girl of 21 in which the nerve symptoms appeared over eleven years after her return to France from New Caledonia. *L. R.*

MANALANG (C.). **Significance of Pathologic Findings in Biopsy Materials from Lepers, III.**—*Monthly Bull. Philippine Health Serv.* 1932. Oct. Vol. 12. No. 10. pp. 541–550. [23 refs.]

——. **Significance of Pathologic Findings in Biopsy Materials from Lepers, IV.**—*Ibid.* pp. 551–554.

These are two further brief notes in support of the author's remarkable suggestion that the *Myco. leprae* is not the cause of the disease, but "leprosy must be due to the activity of a virus stage of *M. leprae,* and not the bacilli," because the bacillus is scanty in the tuberculoid cases. *L. R.*

ARAUJO (H. C. de Souza). Haverá uma fórma filtrante do Mycobacterium leprae ?—*Brasil-Medico.* 1933. Feb. 4. Vol. 47. No. 5. pp. 80–82.

BENCHETRIT (A.). El primer centenar de enfermos de lepra curados.—pp. viii + 145. With numerous illustrations. 1933. Bogota : Editorial Minerva.

PEZZI (Giuseppe). Tentativi di terapia della lebbra anestetica con iniezioni endovenose di autoliquor. (Osservazioni cliniche e ricerche di Laboratorio.) —*Ann. di Med. Nav. e. Colon.* 1933. Mar.–Apr. 39th Year. Vol. 1. No. 3–4. pp. 183–186.

SMIDT (H. N.). Röntgenbehandeling van lepra.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1932. Dec. 6. Vol. 72. No. 25. pp. 1690–1704.

MISCELLANEOUS.

QUARTERLY BULLETIN, HEALTH ORGANISATION, LEAGUE OF NATIONS. Geneva. 1933. Mar. Vol. 2. No. 1. pp. 3–115. With 2 maps. —**The Cape Town Conference. Report of the International Conference of Representatives of the Health Services of Certain African Territories and British India, held at Cape Town, November 15th to 25th, 1932.**

The Cape Town Conference was called by the Health Section of the League of Nations at the instance of the Union Health Department of South Africa. Sir George BUCHANAN represented the Health Committee and was appointed Chairman, and Dr. C. L. PARK, Director of the Eastern Bureau at Singapore, was General Secretary. The countries represented were British and Portuguese, namely Basutoland, Bechuanaland and Swaziland, Kenya, Gold Coast, Nigeria, Northern and Southern Rhodesia, South West Africa, Tanganyika, Uganda, Zanzibar, British India, Angola, Mozambique and the Union of S. Africa. The Rockefeller Foundation was also represented.

The subjects considered were yellow fever, plague, smallpox, leprosy, rural hygiene, dengue, transmission by aircraft of diseases other than yellow fever; about half the report is concerned with yellow fever and plague.

Yellow Fever.—The possibilities of extension of yellow fever to regions of Africa now unaffected formed the chief concern of the Conference, and especially with regard to aircraft, and this is emphasized by the inclusion of a map of Africa indicating the air routes, present and in contemplation, British, French, Belgian, Portuguese, Italian and Dutch (the last two in the North of Africa only). Either the human or mosquito carrier may be conveyed by aircraft and precautions must be taken against both risks.

Yellow fever must be regarded as endemic over a large section of Western Africa and it is noted that its occurrence in a place where it was not previously known may often be explained not by the introduction of infection but by the introduction of susceptibles. Precision in the matter of its distribution may now be obtained by mouse protection tests working outwards from known endemic areas. After giving careful consideration to the terms of the International Sanitary Convention for Aerial Navigation, 1932, the Conference was convinced "that the immediate acceptance of the principles therein formulated will not only form an invaluable safeguard against the spread of yellow fever to other countries when air travel routes are established, but is needed in advance of their establishment so that the conditions required for security will be known when these routes are being planned." Experience of modern methods of control encourages the belief that should yellow fever enter regions in Africa hitherto free it is capable of control and limitation in a way which would be quite impossible with influenza or even malaria.

The additional safeguard of vaccination should be adopted where it is practicable.

India and the Dutch East Indies have prohibited absolutely importation of yellow fever virus for laboratory purposes; the Conference hesitated to make a similar recommendation to African countries so far free from the disease; any legislative or administrative restriction should, they think, be qualified by the reservation that the conditional

admission of the virus may be authorized when diagnostic tests or preparation of vaccine are urgently called for; the virus used for mouse protection tests has so far shown itself incapable of reproducing yellow fever in man or monkey.

The Report goes on to consider the principles of the International Sanitary Convention for Aerial Navigation, 1932, and the measures applied or projected for Aëdes and yellow fever control. The Delegate of the Government of India, General GRAHAM, said that his government considered that in the light of available information "prohibition of air traffic from yellow fever areas to susceptible areas [such as Indian ports] was the only reliable safeguard."

The conclusions of the Report are as follows:—

"1. None of the fundamental observations upon which public health control of yellow fever is based have been disturbed by recent knowledge. Although under exceptional conditions the incubation period in man may be protracted or the infectivity period may be prolonged, and although experimentally a wider range of dispersal of the mosquito vector has been shown to be possible, yet, for practical purposes, public health control of yellow fever can be based upon the observations that yellow fever is transmitted from actual human cases only in the first three days of the attack, that the incubation period of new cases does not exceed six days, that the agent of transmission is a domestic mosquito which remains in, or in the immediate vicinity of, the house where it has fed, and that the insect, after feeding upon an infected case, must survive for twelve days before it can transmit the virus to another person.

"2. The mouse-brain virus protection test may be accepted as specific for yellow fever.

"3. Large areas in the countries of central, eastern and southern Africa, believed at present to be free from yellow fever infection, must be regarded as infectible.

"4. It is of obvious importance that immediate action be taken to ascertain the position with respect to the presence of the disease, unsuspected, in endemic form, and also to the susceptibility of the population to the disease, in those African countries in which yellow fever has so far been unknown. In these enquiries, the Government of the Anglo-Egyptian Sudan, not represented at this Conference, should be invited to participate. It is satisfactory to record that action recommended in this section is already envisaged in French Equatorial Africa, as well as in Angola; that protection test surveys have already been commenced in the Belgian Congo, and that arrangements are now in progress for similar surveys to be carried out in the Union of South Africa, Bechuanaland Protectorate, South West Africa, Mosambique, Southern Rhodesia, Northern Rhodesia, Tanganyika, Kenya, Uganda and Zanzibar.

"5. Steps should be taken for the provision of equipment and for the training of staff at laboratories in Africa, appropriately selected and situated, where necessary yellow fever work can be carried out after the termination of the detailed work covering many parts of Africa, which is now being undertaken by the Rockefeller Foundation. Such work would include the performance of protection tests and of protective vaccination.

"6. For the purposes of paragraphs 4 and 5 above, the importation of fixed mouse-brain yellow fever virus should be permitted in laboratories in Africa, under Government authority and control.

"7. The co-operation of the Rockefeller Foundation in the establishment of laboratories for yellow fever control advocated in paragraphs 4, 5 and 6 above, in the manner suggested by Dr. Sawyer, is particularly welcome.

"8. The action taken by the British Government in providing facilities in England for protective vaccination against yellow fever deserves attention, and it is hoped that other administrations concerned with public

health work in Africa will provide similar facilities at those laboratories where yellow fever work is being carried out or is being projected.

" 9. The risk that infection with yellow fever from west to east may spread from village to village by the opening up of new trade and motor routes should be taken into account. It is hoped that the present position along such routes may be determined by protection test surveys of the population, and that the position thereafter may be reviewed from time to time by re-surveys. This slow method of spread of the disease may ultimately prove more capable of breaking down our defences than the more rapid spread which can result directly from modern fast means of transport. In this connection it is suggested that the excellent motor routes which now exist from the French Cameroons across French Equatorial Africa and the northern section of the Belgian Congo need to be considered in connection with risk of infection to the Anglo-Egyptian Sudan and to Uganda.

" 10. Although the possibility exists of transport of infected mosquitoes by air, rail or road, it is considered that the greatest risk, or at least the more difficult risk to avoid, consists of the transport of a person during the incubation period of the disease.

" 11. It is agreed that the Governments of African countries should be advised forthwith to accept and ratify the International Sanitary Convention for Aerial Navigation, 1932.

" 12. The systematic communication of new facts in regard to yellow fever in Africa to the Office International d'Hygiène Publique in Paris, for consideration by its Yellow Fever Commission, is provided for by the above Convention, and this system should be utilised as fully as possible.

" 13. Yellow fever control, as now carried out in the West African countries, is an important factor for the protection of neighbouring countries from yellow fever infection, and it is important that these measures should be continued and their efficiency augmented. Special stress is laid upon the provision of pipe-borne water supplies, active destruction of Aëdes in towns and villages, and the segregation of the non-indigenous population in residential areas in which effective Aëdes control can be maintained.

" 14. The Health Departments of African countries believed at present to be free from yellow fever infection should obtain more information concerning Aëdes infestation than is now available, and should introduce, or make more effective, measures for the control of Aëdes in those centres at which risk of introduction of yellow fever infection is specially to be apprehended."

Annexed are four papers, by SAWYER of the International Health Division on the yellow fever problem as it relates to Africa, by DUFF and Damas MORA on yellow fever control in the Gold Coast and Angola, and by R. R. SCOTT on the yellow fever problem as it affects Tanganyika Territory; MORA stated that there has been no yellow fever in Angola since 1899.

Plague.—In the report on plague the conditions in the Union of South Africa are contrasted with those in East Africa: in the former the disease prevails among wild rodents, in the latter among domestic rodents. Infection is widespread over the Union and extends across Bechuanaland into South West Africa and southern Angola. Invasion of Southern and Northern Rhodesia and of Portuguese East Africa is thought by the delegates of those countries to be possible or even probable. The connecting link between the wild rodents, chiefly gerbilles (*Tatera lobengulae*) and man is the multimammate mouse (*Mus coucha*) which in the Cape area is replaced by the striped mouse (*Rhabdomys pumilio*). The urban areas with few exceptions and all the ports have been free for 17 years. In the Union every precaution is taken to prevent conveyance of plague overseas in exported maize.

More detail of the position of plague in the Union and in South West Africa is given in an annexure by Sir E. N. THORNTON. He shows that certain fleas of veld rodents known to be potential plague vectors can survive without hosts easily for 2 months and sometimes for 3 or even 4 and are then capable of reinfecting with plague. (See Appendix.)

Other annexures tell the position in Ovamboland and Angola.

Smallpox.—A Committee was appointed "to consider the adoption of uniform regulations for the prevention of the introduction into southern and eastern Africa of smallpox from India," and made recommendations on the subject.

Rural Hygiene.—A Committee made an interesting report from which the following general principles emerged :—

"(*a*) That, in countries with a large backward native population, it would be, generally speaking, inadvisable to separate preventive from curative medicine, in so far as the personnel which comes in direct contact with the common people is concerned. The native races, in most countries, have to be convinced first of all that the personnel of the health organisation has the good of the people at heart, and that it can and will help them. This can be demonstrated most easily through curative activities, which provide an opportunity for tangible demonstration of helpfulness.

"(*b*) That neither preventive nor curative measures can achieve a marked degree of efficiency without full co-operation between the administrative and technical departments of Government and the Health Department.

"(*c*) That most important in the amelioration of health conditions are measures directed towards the raising of the economic status of the population ; this automatically results in the improvement of two, at least, of the most important factors operating towards raising the standard of national health—*i.e.*, nutrition and housing.

"(*d*) That education in elementary hygiene is one of the most important activities. This should commence in the primary schools, where it should take the form of instruction in practical hygiene and not, as is at present too often the case, theoretical instruction principally in elementary anatomy and physiology.

"(*e*) That both in the preventive and curative organisations in many African territories, whether colonial or dominion, and probably elsewhere, native personnel must be utilised to the fullest possible extent."

These principles are discussed in the report, and those who are interested should consult it.

Other matters under consideration were the control of leprosy in Africa, dengue, and the transmission by aircraft of diseases other than yellow fever. *A. G. B.*

APPENDIX.

Plague-Infected Rodents in South Africa and Associated Mammals with their Common Ectoparasites.

1. **House rat** (*Rattus rattus*)
   Louse : *Polyplax spinulosus*, Burm.
   *Fleas : *Xenopsylla cheopis*, Rothsc.
   Leptopsylla musculi, Dug.
   Xenopsylla brasiliensis, Baker.
   Ceratophyllus fasciatus, Bosc.
   Ceratophyllus londiniensis, Rothsc.
   Ctenocephalus canis, Curt.

2. **Brown rat** (*Rattus norvegicus*)
   Louse : *Polyplax spinulosus*, Burm.
   Fleas : *Xenopsylla cheopis*, Rothsc.
   Ceratophyllus fasciatus, Bosc.
   Leptopsylla segnis, Schönh.

3. **House Mouse** (*Mus musculus*)
   Fleas : According to Bedford, no parasites have been found on this mouse in South Africa. This view is certainly wrong, as during plague outbreaks officers of the Department have found plague-infected mice with fleas. Some of these have been identified as *Leptopsylla musculi* which has been proved capable of conveying plague.

4. **Gerbille** (*Tatera lobengulae*)
   Ticks : *Haemaphysalis leachi*, Aud.
   Ixodes pilosus, Koch.
   Mites : *Laelaps muricola*, Trägårdh.
   Haemolaelaps sp.
   Louse : *Linognathoides faurei*, Bedf.
   Fleas : *Dinopsyllus lypusus*, J. & R.
   Chiastopsylla rossi, Watrst.
   Xenopsylla eridos, Rothsc.
   Listropsylla stygius, Rothsc.
   Ctenophthalmus calceatus, Watrst.
   Leptopsylla musculi, Duges.

5. **Multimammate mouse** (*Mastomys coucha*)
   Mite : *Laelaps muricola*, Trägårdh.
   Louse : *Linognathoides faurei*, Bedf.
   Fleas : *Dinopsyllus lypusus*, J. & R.
   Xenopsylla eridos, Rothsc.
   Chiastopsylla rossi, Watrst.
   Xenopsylla brasiliensis, Baker.
   Pulex irritans, L.

6. **Ground Squirrel** (*Geosciurus capensis*)
   Mite : *Haemolaelaps sp.*
   Louse : *Linognathoides faurei*, Bedf.
   Fleas : *Xenopsylla erilli*, Rothsc.
   Ctenocephalus canis, Curt.
   Echidnophaga bradyta, J. & R.
   Echidnophaga gallinaceus, Westw.
   Xenopsylla eridos, Rothsc.
   Dinopsyllus lypusus, J. & R.
   Pulex irritans, L.

7. **Spring hare** (*Pedetes caffer*)
   Tick : *Ixodes pilosus*, Koch.
   Mites : *Androlaelaps sp.*
   Haemolaelaps sp.
   Louse : *Eulinognathus denticulatus*, Cummings.
   Flea : *Xenopsylla caffer*, J. & R.

8. **Striped mouse** (*Rhabdomys pumilio*)
   Mite : *Laelaps muricola*, Trägårdh.
   Fleas : *Dinopsyllus lypusus*, J. & R.
   Xenopsylla eridos, Rothsc.
   Chiastopsylla rossi, Watrst.
   Listropsylla agrippinae, Rothsc.
   Listropsylla chelurae, Rothsc.
   Dinopsyllus longifrons, J. & R.
   Xenopsylla hirsuta, Ingram.

9. **Karroo rat, eastern** (*Paratomys luteolus*)
   Fleas : *Chiastopsylla pitchfordi* (*sp. nov.*)
   Listropsylla agrippinae, Rothsc.
   Dinopsyllus longifrons, J. & R.
   Xenopsylla eridos, Rothsc.
   Chiastopsylla rossi, Watrst.

10. **Karroo rats** (*Myotomis granti*)
    Fleas : *Listropsylla agrippinae*, Rothsc.
    Dinopsyllus lypusus, J. & R.
    Xenopsylla eridos, Rothsc.
    Chiastopsylla pitchfordi (*sp. nov.*)
    Chiastopsylla rossi, Watrst.
    (*Myotomys broomi*)
    Fleas : *Chiastopsylla mulleri* (*sp. nov.*)
    Listropsylla agrippinae, Rothsc.
    Chiastopsylla rossi, Watrst.
    Xenopsylla eridos, Rothsc.
    Hypsophthalmus aganippes, Rothsc.

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*Ectoparasites (fleas arranged in order of frequency of occurrence).

11. **Namaqua gerbille** (*Desmodillus auricularis*)
    Fleas : *Xenopsylla eridos*, Rothsc.
    Dinopsyllus lypusus, J. & R.

12. **Hare*** (*Lepus capensis*)
    Tick : *Haemaphysalis leachi*, Aud.
    Fleas : *Ctenocephalus canis*, Curt.
    Xenopsylla eridos, Rothsc.

13. **Dwarf mouse** (*Leggada deserti*)
    Fleas : *Dinopsyllus lypusus*, J. & R.
    Xenopsylla eridos, Rothsc.
    Listropsylla stygius, Rothsc.

14. **Fat mouse** (*Steatomys krebsi*)
    Fleas : *Dinopsyllus lypusus*, J. & R.
    Listropsylla stygius, Rothsc.

15. **Large-eared mouse** (*Malacothrix typicus*)
    Fleas : *Dinopsyllus lypusus*, J. & R.
    Xenopsylla eridos, Rothsc.
    Listropsylla stygius, Rothsc.

16. **Vlei rat** (*Otomys irrotarus*)
    Fleas : *Dinopsyllus lypusus*, J. & R.
    Xenopsylla eridos, Rothsc.
    Xenopsylla cheopis, Rothsc.

17. **White-tailed rat** (*Mystromys albicaudatus*)
    Fleas : *Dinopsyllus lypusus*, J. & R.
    Chiastopsylla rossi, Watrst.
    Xenopsylla cheopis, Rothsc.

18. **Suricate** (*Suricata suricatta*)
    Tick : *Haemaphysalis leachi*, Aud.
    Fleas : *Ctenocephalus canis*, Curt.
    Xenopsylla erilli, Rothsc.
    Echidnophaga bradyta, J. & R.
    Echidnophaga gallinaceus, Westw.
    Xenopsylla eridos, Rothsc.
    Chiastopsylla rossi, Watrst.

19. **Yellow mongoose** (*Cynictis penicillata*)
    Tick : *Haemaphysalis leachi*, Aud.
    Fleas : *Ctenocephalus canis*, Curt.
    Xenopsylla erilli, Rothsc.
    Echidnophaga bradyta, J. & R.
    Echidnophaga gallinaceus, Westw.
    Xenopsylla eridos, Rothsc.
    Chiastopsylla rossi, Watrst.

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*Two other varieties of hare—namely, the *Lepus saxatilis* and *Lepus zuluensis*—have also been incriminated, but their associated ectoparasites do not yet appear to have been accurately recorded.

REVIEWS AND NOTICES.

ROYAUME DE BELGIQUE. **Fonds Reine Elisabeth pour l'assistance médicale aux indigènes du Congo Belge (Foréami). Rapport annuel sur l'exercice 1931.** [Report for 1931 of the Queen Elisabeth Fund for Medical Assistance to the Natives of Belgian Congo.]—142 pp. With 12 figs. on 5 plates, 7 diagrams & 6 maps. 1932. Bruxelles: Marcel Hayez, Imprimeur de l'Académie Royale de Belgique, 112 rue de Louvain.

Dr. DUPUY's report sets out at great length and in much detail the local arrangements made to facilitate the working of the medical units of this special organization, not only with regard to the medical subdivision of the country but also in relation to the co-operation of "Foréami" with the existing government and other medical services such as missions.

Emphasis is laid on the necessity for obtaining all possible information as to the increase or decrease of populations in the selected areas, and to this end a considerable amount of work has been carried out on the birth rate, and the death rates of various age groups from diseases which are endemic or epidemic.

The subject of the influence of venereal disease in lowering the birth rate is especially reverted to, and the importance of gonorrhoea in this respect is stressed. The author points out that accurate information as to abortion and still-births is very difficult to obtain in a country where such incidents may result in the woman being sent away by her husband. Of the various forms of marriage arrangement the author expresses a preference for bigamy as being that best adapted to the domestic needs of the native and the most favourable for the increase of population.

Among the diseases enumerated sleeping sickness is the one which receives most attention; other diseases, yaws, leprosy, malaria, phagedaenic ulcers, amoebic dysentery and helminthiasis, being briefly discussed. For each district figures are given of the new cases of trypanosomiasis found during the year, of the old cases under treatment, and of the results, whether cured, died or disappeared.

Dr. Dupuy thinks that the ascertained steady diminution of the incidence of sleeping sickness in such an area as Mayumba, where arsenic-incurable cases are many, can only be explained on the basis of the feeble transmissibility of the "arsenic-resistant" strain. [Recent work by YORKE and his collaborators (*ante*, p. 448), however, proves that an arsenic-resistant strain can without difficulty infect glossina, and further, that the resistance is retained by the trypanosomes unaltered even after two passages through the fly.] The examinations deal with large figures; among 355,855 natives medically examined by officers of Foréami in 1931, 1,648 new cases of sleeping sickness were found, while 7,470 old cases were undergoing treatment; 5,398 lumbar punctures were carried out during the year.

The author mentions several factors not in themselves strictly medical which adversely affect the proper functioning of such an organization as this. One is the problem of the small villages, isolated and remote, which have sprung up as a result of the splitting off of certain households from large villages, or are the last remains of villages long since decayed; visits of medical officers to these numerous small hamlets are expensive affairs, with long journeys and many carriers to pay. Another is the fact that the death rate is very high among those tribes who do not cultivate vegetables and fruits; he urges the importance of the agriculturist taking his share in the work of raising the standard of health by the training and education of the people in proper methods of cultivation.

The section on infant mortality illustrates how necessary it is to reach some accepted international standard for this classification. Such sentences as "Sur les 16,957 nourissons, 1,645 meurent par an, soit près de 98%" may be at least a partial explanation of some of those "fantaisiste"

infant death rates which, the author rather complains, have been attributed by some writers to parts of the Belgian Congo.

Those who are working at the development of medical services for the remoter natives in tropical countries should consult the original report, where they will find much information in numbers of figures and tables embodying the results obtained. *D. B. Blacklock.*

CALCUTTA. **Tenth Conference of Medical Research Workers held at Calcutta from 5th to 10th December 1932.**—pp. iii+203. 1933. Simla: Government of India Press.

A conference of this sort strikes the imagination as being ideal for the promotion of research. It is not an ordinary scientific congress, for the members are all, or nearly all, delegates who are experts in the particular researches which they are conducting or directing. In this conference we see the meeting of those having the power of recommendation of necessary funds with the workers themselves and the effect of what is equivalent to a critical parliamentary opposition, though not on party lines, upon the proposals for new work or the continuation of old work. The list of delegates and their official standing show how abundant and varied are their qualifications for the promotion of research. The Director-General of the Indian Medical Service, the Public Health Commissioner of the Government of India, directors and assistant directors of the research institutes, professors at the Medical Colleges and at the important School of Tropical Medicine, the assistant-director of Hygiene and Pathology Army Headquarters, the directors and assistant directors of public health of the provinces, the director of the Zoological Survey of India, the director of the Botanical Survey of India, the deputy-director of Agriculture (Cinchona) and the Animal Husbandry expert, a representative of the Rockefeller Foundation, chief medical officers of railway systems, chemical examiners to Government, the imperial serologist to Government and others are present here to confer with each other and with the other workers. Six days of strenuous work seems almost too short for a time to traverse the range of subjects which come up for discussion, but it must be remembered that the conference is an annual one. We find, as might be expected, the matter contained in these transactions of extreme interest for tropical medicine, from the opening speech by the chairman to some of the detailed appendices which are supplied at the end of the brochure. It is interesting to have placed on record the opinion that the publications of the Bureau of Hygiene and Tropical Diseases are "absolutely essential to every research worker in India"; [the Indian Research Fund Association backs this opinion with an annual contribution to the Bureau].

In these transactions we have set out much information of a particular sort which has a bearing on the research questions of the day and, we may add, "of the fray." Fortunately these are usually published in the current journals. Under the heading of the Drug Addiction Enquiry it is interesting to learn with regard to opium that even at the present time "0·5 to 1 per cent. of the population used the drug habitually," that "cocaine eating was widespread and chloral hydrate was a new and dangerous addiction." A third hamster, it is announced, on which infected sandflies were fed, has become infected with Leishmania. One of the fundamental questions for biologist and chemist alike is the nature of the bacteriophage. It is referred to in discussion as diffusing freely in solution like an inorganic salt and, in opposition to this, as having been proved to be corpuscular in nature. How best to get rid of 400,000 lbs. of quinine profitably for public health purposes was the subject of some interchange of opinion. Another highly important subject on which nations, provinces and even towns are peculiarly sensitive is the endemicity of disease. It is not on cholera, on this occasion, that the discussion turns but on plague. There is little basis, it is contended, "for the statement . . . that Rangoon had constantly infected other ports by shipping infected rats in cargo. . . . The ships

that visit Rangoon were more likely to bring infected rats and fleas than to take them away."

The work of the conference is not by any means restricted to tropical diseases and we may instance the important work going on in regard to maternal mortality in childbirth. A maternal mortality in a series of 31 tea gardens of 42 per 1,000 births is very striking, and probably half of it is due to anaemia of pregnancy. The anaemia " is very likely related to a diet deficiency " of vitamin B. Nutritional diseases receive very special attention in India and the large-scale work which has been done there, is regarded generally as of the highest importance. The promised publication on tropical skin-diseases will be looked forward to.

Appendices to these transactions total forty and while many of them are official, others represent notable contributions to research literature. Those referring to work on malaria, plague, cholera, bacteriophage, rabies, kala azar, nutritional research, the Simuliidae, anaemia of pregnancy, indigenous drugs, skin diseases, and the flora and fauna of water supplies are some of the " notes " which may be mentioned as noteworthy.

W. F. Harvey.

MARTINI (E.). **Zoonosen der Haut in wärmeren Ländern.** [Zoonoses of the Skin in Warm Countries.]—Reprinted from Jadassohn's *Handbuch d. Haut- u. Geschlechtskrankheiten.* 1932. Vol. 12. No. 1. pp. 575–707. With 59 figs.

This section of Jadassohn's handbook of diseases of the skin and venereal diseases, deals with those cutaneous affections of the tropics which are caused directly by the attacks of animals. It is complementary to a section by W. PICK, that has not yet appeared, which will deal with the corresponding conditions occurring in temperate zones. Since many " zoonoses " are prevalent in all regions, the authors have been obliged to divide the subject between them in a more or less arbitary fashion. They have excluded parasitic diseases that are transmitted by insects or other animals, and they have excluded allergic conditions which chance to be due to animal products, such as urticaria caused by specific proteins. There is left a residuum of conditions about which it is often very difficult to obtain information from text books, and which it is therefore most useful to have brought together in a single volume. These are arranged in three groups. (i) The first includes the toxic effects of insects on the skin. Here the stings of wasps and bees are described, and the urticating hairs of certain moth larvae, and the various types of blistering beetles (including also an account of the beetle larva which is extracted to produce an arrow poison by natives in the Kalahari Desert). The greater part of this section is devoted to a detailed discussion of the mechanism of the lesions caused by blood-sucking insects. The evidence in this field is conflicting, but Martini supports the view that several factors are at work. The wheal formation which follows immediately after biting is probably always an allergic phenomenon, but the cause of the persistent itching papules is uncertain. This part is illustrated by a series of photographs of the effects of insect bites. (ii) The second section treats of insects which are stationary parasites of the skin : the chigger flea and the myiasis producing maggots. Myiasis is divided into two forms—myiasis benigna, which comprises infestation by the tumbu fly (*Cordylobia*) in Africa and *Dermatobia* in tropical America, and myiasis maligna caused by various species of *Chrysomyia, Wohlfartia* and *Sarcophaga.* The species responsible for myiasis maligna in different parts of the world (so far as they are at present known) are listed. (iii) The third section is the shortest and includes brief accounts of the toxic effects of coelenterates, echinoderms, molluscs, spiders, scorpions and myriapods. The publication concludes with a bibliography of 22 pages, classified according to subjects.

V. B. Wigglesworth.

KRANZFELD (A. M.). **Parasitic Worms of Man. An Introduction to Medical Helminthology.**—120 pp. With 8 plates and 54 text figs. 1931. Moscow—Leningrad (State Medical Publication). [In Russian.] [Roubles 2.50.]

This is a short text-book of medical helminthology, intended for the use of medical students and practitioners. Since its main object is to serve as a guide for laboratory work, the material is treated almost exclusively from the general zoological point of view. The first part of the book contains an account of the biology and physiology of parasitic worms, followed by a description of the general pathology of helminthic infections. The methods of laboratory diagnosis are described in some detail and there is a section devoted to the epidemiology of helminthiasis. In the systematic description of the worms, to which the main part of the book is devoted, particular attention is given to forms occurring in Russia. The descriptions are illustrated chiefly by line-drawings, and there are a number of useful diagrams and tables summarizing, in schematic form, the information given in the text. *C. A. Hoare.*

PHILIPTSCHENKO (A. A.). [**Intestinal Protozoa, and the Diseases caused by them. A Manual for Medical Practitioners and Laboratory Workers.**]—212 pp. 1933. Leningrad: State Medical Publications. [In Russian.] [Roubles 4·50].

This is a manual of human intestinal protozoa for the use of Russian medical practitioners and laboratory workers. About two-thirds of the book, comprising seven chapters, are devoted to amoebiasis in all its aspects: aetiological, clinical, epidemiological and therapeutical. The remaining four chapters deal with the intestinal flagellates, coccidia and infusoria. The treatment of the subject is conventional, though more than usual attention is given to the morphology and biology of the protozoa, as one of the objects of the book is to serve as an introduction to parasitology in general. The illustrations, the majority of which are not original, are reproduced much better than in other recent publications from U.S.S.R. The book as a whole is up-to-date, with the glaring exception of the chapter on coccidiosis, in which *Eimeria wenyoni*, *E. oxyspora* and *E. snijdersi* are still described as human parasites. The bibliography contains about 400 references, and there is an alphabetical index. *C. A. Hoare.*

KIKUTH (Walter). **Die Bartonellen und verwandte Parasiten bei Mensch und Tieren.** [The Bartonellas and Related Parasites in Man and Animals.]—Reprinted from *Ergebnisse d. Hyg. Bakt. Immunitätsforschung u. Experim. Therap.* 1932. Vol. 13. pp. 559–619. With 12 text figs. [10 pages of refs.]

During recent years a large amount of experimental work has been carried out on the small bacillus-like organisms known as *Bartonella* and their allies which invade the red blood corpuscles of man and animals. GRAHAM-SMITH in 1905 gave the first account of one of these from the mole. It was named *Grahamia* by TARTAKOWSKY in 1910 and *Grahamella* by BRUMPT in the following year. Since their first description the number of species of *Grahamia* has been steadily on the increase and a large number of small mammalian hosts are now known. Related but somewhat different organisms were seen by BARTON in 1909 in the red blood corpuscles of cases of Oroya fever. They were rediscovered by STRONG and his collaborators and named by them in 1915 *Bartonella bacilliformis*. NOGUCHI investigated this organism, obtaining it in pure culture, and by inoculation of monkeys proved what had long been suspected, that Oroya fever and verruga peruviana were different manifestations of one and the same infection. Similar investigations were carried out at about the same

time by MAYER and KIKUTH. In 1921 MAYER discovered inclusions in the red blood corpuscles of anaemic rats and named them *Bartonella muris*. LAUDA then observed the regular appearance of these bodies in the red blood corpuscles of rats after splenectomy and it was quickly realized that the inclusions were parasites capable of causing severe anaemia. The observations on the influence of the spleen and its bearing on problems of immunity stimulated numerous investigators to take up their study so that a mass of literature on the subject has now accumulated. Similar parasites have been discovered in the hamster, mouse, dog and other animals and much work has been done on the relation of these forms to one another. It is now clear that animals become infected and if they recover become chronic carriers of the parasite which increases rapidly in numbers again if the spleen is removed. Another organism occurring in or on the red blood corpuscles was discovered in mice by SCHILLING, who named it *Eperythrozoon coccoides*. These are round or spherical bodies and thus differ from the bacillus-like *Bartonella* which more closely resemble the *Grahamella* or *Grahamia*, as they should be called. There is this important difference, that splenectomy has not the influence on *Grahamella* infections that it has on those due to *Bartonella*. There are yet other bodies which occur in red blood corpuscles the nature of which is still more obscure. It seems evident that all these various bodies are related to one another, and the author, who has himself contributed largely to our knowledge of these organisms, has rendered a great service to parasitology and haematology by gathering together the scattered literature and critically reviewing it in the 60 pages of this very interesting and valuable illustrated publication.

C. M. Wenyon.

D'OELSNITZ (M.). **Diagnostic et traitement du kala-azar méditerranéen de l'enfant et de l'adulte.** Preface du Pr. Fernand BEZANÇON. [Diagnosis and Treatment of Mediterranean Kala Azar.]—pp. viii+110. With 18 figs. 1933. Paris, VI : Masson et Cie, 120 Boulevard Saint-Germain. [17 fr.]

This little book has been written for those who are likely to encounter kala azar in children and adults in the South of France, where the disease, regarded hitherto, in adults at least, as always of extraneous origin, is now actually endemic and apparently on the increase. The ninety odd pages give all the essentials of clinical features, differential diagnosis and treatment of kala azar so that the book is bound to be of use to those who have had no previous experience of the disease. A few pages are devoted to other matters, such as geographical distribution, the causative organism and the method of transmission. It is clear that the author is not conversant with much of the work which has been carried out with sandflies, for he states that the dog tick has been incriminated as a probable vector more than any other insect. This statement is based on certain quite inconclusive experiments of BLANC and CAMINOPETROS. Apart from this the book appears to be free from misstatements and amply fulfils the function for which it was intended. *C. M. Wenyon.*

MADRID. **Memoria de la Campaña contra el paludismo (1930–1931).** [The Antimalaria Campaign in Spain.] Ministerio de la Gobernación, Dirección general de Sanidad. Comisión Central de Trabajos Antipalúdicos.—pp. xvii+341. With 6 figs. & 5 graphs. 1932. Madrid.

This report is already so subdivided that it cannot be profitably reviewed or abstracted. In 321 pages account is given of the prevalence of malaria and of other diseases—enteric, undulant fever, leishmaniasis, tuberculosis, etc.—in 43 districts, the splenic and parasitic indices and the measures

taken to deal with the problem in each. The information is presented in text and in tables. Appended is a chapter of entomological data, giving the various species of mosquitoes and Phlebotomus found in Spain, their geographical distribution and by whom recorded. *H. H. S.*

MONTEIRO (J. Lemos). **Estudos sobre o typho exanthematico de S. Paulo.** [Studies on Sao Paulo Typhus Fever.]—*Mem. Inst. Butantan.* 1931. Vol. 6. pp. 1–135. With 54 charts & 6 plates (3 coloured). [67 refs.] English summary pp. 125–132.

This is a monograph concerning the S. Paulo type of typhus fever, written by Professor Monteiro and in it are gathered into one all that he has previously done and published on this interesting disease. The whole consists of ten chapters and is divided into two parts, the first giving an account of the properties of the virus and the results of experimental work on various laboratory animals, the second discussing the connexion of *Rickettsia brasiliensis* with the infection.

The separate papers dealing with the question have already been reviewed (see this *Bulletin* 1932, Vol. 29, pp. 17, 447, 778; 1933, Vol. 30, p. 391). The English summary is sufficiently full to furnish an excellent picture of the disease and to demonstrate points of difference from other forms of endemic typhus. *H. H. S.*

RUGE (Reinhold). **Tropenkrankheiten.** [Tropical Diseases.]—Reprinted from *Handbuch der gesamten Unfallheilkunde.* [1932.] Vol. 2. pp. 260–313. With 9 figs. [1 page of refs.] [Review appears also in *Bulletin of Hygiene.*]

This article deals with the medico-legal aspects of occupational insurances and with claims for compensation by sailors, who have contracted tropical diseases as a result of their calling. Detailed descriptions of tropical diseases, their pathology and treatment are not given, and mention is made only of those diseases of warm climates to which sailors are ordinarily exposed.

There is a useful summary of the main features of chronic and latent malaria, and it is emphasized that men, suffering from such sequelae as trigeminal neuralgia and various forms of paralysis, may be unfairly suspected of malingering if the possibility of a former malarial infection is overlooked. Difficulty may also occur in estimating the validity of claims for compensation for the occasional ill-effects of treatment, such as atoxyl blindness, quinine amaurosis, etc. Quinine idiosyncrasy and acquired hypersensitiveness to quinine are also discussed.

The article is valuable since it lays stress upon certain features of tropical diseases which are, as a rule, rather neglected in ordinary text-books. *H. J. Walton.*

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
By the South Essex Recorders, Limited, High Road, Ilford.

(401) Wt. P1/101 1875 8/33 S.E.R. Ltd. Gp. 353.